AD_____

CONTRACT NUMBER DAMD17-93-C-3101

TITLE: Blast Overpressure Studies with Animals and Man

SUBTITLE: Nonauditory Damage Risk Assessment for Simulated 155mm Self-Propelled Howitzer Blast

PRINCIPAL INVESTIGATOR: Daniel L. Johnson, Ph.D.; John T. Yelverton, M.S.; William Hicks, B.S.; Barbara Merickel, D.V.M.

CONTRACTING ORGANIZATION: EG&G Management Systems, Inc. Albuquerque, NM 87119-9100

REPORT DATE: May 1997

TYPE OF REPORT: Final, Task Order 2

PREPARED FOR: Commander
U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	May 1997	Final, Task Order 2 (21 Jun 93 - 28 Feb 97)

4. TITLE AND SUBTITLE
Blast Overpressure Studies with Animals and Man
SUBTITLE: Nonauditory Damage Risk Assessment for Simulated 155mm Self-Propelled Howitzer Blast

5. FUNDING NUMBERS
DAMD17-93-C-3101

6. AUTHOR(S)
Johnson, Daniel L., Ph.D.; Yelverton, John T., M.S.; Hicks, William , B.S.; Merickel, Barbara, D.V.M.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
EG&G Management Systems, Inc.
Albuquerque, NM 87119-9100

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

This study was undertaken to establish the nonauditory injury subthreshold in a simulated muzzle blast environment like that produced when firing an M109 155 mm self-propelled howitzer (SPH) with one or more hatches open. An explosively driven shock tube, the hull of an M108 SPH, and a six-plate reflector system were used to produce the required muzzle blast signature. Using as many as 40 anesthetized sheep for each exposure condition, safe no-injury levels were established with an occasional minor upper respiratory tract lesion. These levels were 24 kPa for 6 blasts and 20 kPa for 25 to 100 blasts.

14. SUBJECT TERMS
155-mm SPH Muzzle Blast Simulation, Nonauditory Damage Risk, Simulated Muzzle Blast Risk Assessment, Sheep Muzzle Blast Assessment

15. NUMBER OF PAGES
169

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unlimited

FOREWORD

Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the US Army.

____ Where copyrighted material is quoted, permission has been obtained to use such material.

____ Where material from documents designated for limited distribution is quoted, permission has been obtained to use the material.

____ Citations of commercial organizations and trade names in this report do not constitute an official Department of Army endorsement or approval of the products or services of these organizations.

✓ In conducting research using animals, the investigator(s) adhered to the "Guide for the Care and Use of Laboratory Animals," prepared by the Committee on Care and Use of Laboratory Animals of the Institute of Laboratory Resources, National Research Council (NIH Publication No. 86-23, Revised 1985).

✓ For the protection of human subjects, the investigator(s) adhered to policies of applicable Federal Law 45 CFR 46.

____ In conducting research utilizing recombinant DNA technology, the investigator(s) adhered to current guidelines promulgated by the National Institutes of Health.

____ In the conduct of research utilizing recombinant DNA, the investigator(s) adhered to the NIH Guidelines for Research Involving Recombinant DNA Molecules.

____ In the conduct of research involving hazardous organisms, the investigator(s) adhered to the CDC-NIH Guide for Biosafety in Microbiological and Biomedical Laboratories.

Daniel L Johnson 22 Jul 97

Daniel L. Johnson

PI - Signature Date

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (CONTINUED)

LIST OF TABLES

LIST OF TABLES (CONTINUED)

FINAL REPORT

TASK ORDER 2 - FY 94/95

DAMD17-93-C-3101

NONAUDITORY DAMAGE-RISK ASSESSMENT FOR SIMULATED 155MM SELF-PROPELLED HOWITZER MUZZLE BLAST

INTRODUCTION

This report describes the final results of studies supported by the Walter Reed Army Institute of Research (WRAIR) undertaken to establish the nonauditory subthreshold for injury in a simulated muzzle blast environment like that produced when firing an M109 155mm self-propelled howitzer (sph) with one or more hatches open. Anesthetized sheep were exposed to various intensities and repetitions of the simulated muzzle blast.

OBJECTIVES

1. To establish the pressure level at which the simulated muzzle blast like that generated by an M109 155mm sph firing top zone rounds, with one or more hatches open, does not exceed the nonauditory injury threshold at the crew positions for 6, 25, or 100 exposures.

2. To compare the results from the above objectives with those from other studies to establish additional damage risk criteria for complex wave environments.

METHODS

As seen in Figure 1, an M108 sph was placed in front of the EG&G Muzzle Blast Simulator (MBS) on Blast Pad 2 at the Army Blast Overpressure Test Site. The site is located on Kirtland AFB, New Mexico and is operated by EG&G MSI. An M108 was used for the simulation in lieu of an M109 because the M108 was readily available. It was also felt that satisfactory results could be obtained with the M108 since the hulls of the two systems are essentially the same. The best simulation was obtained when the rear hatches and doors were removed and a six-plate reflector system was installed at the back of the M108 to collect and direct the blast wave from the simulator into the crew compartment. The simulated muzzle blast waves generated were monitored at three of the crew positions in the M108. Numerous preliminary trials, ranging from firing bare charges of C-4 in front of the M108 sph to generating blast waves from various combinations of shocktubes and reflectors, were conducted to develop the MBS illustrated in the figure.

Once the desired waveform was established, two anesthetized sheep at a time were exposed, one each in the loader and gunner crew positions, to the simulated blast wave. The intensity and repetitions varied as a function of the experimental design.

Waveform Development

The 155mm sph muzzle blast waveform selected by the WRAIR for simulation is illustrated in Figure 2.

As seen in Figure 3, pressure transducers were placed in three crew positions during the development of the simulated muzzle blast waveform. These were positions 3 (loader), 4 (chief of section), and 5 (gunner). They were used as side-on gauges mounted vertically with their sensing elements pointing face-up. In the loader and gunner positions, pressure-time measurements were taken at a height of 1.2 m from the floor of the crew compartment and in the chief of section position, at a height of 1.5 m.

Once the simulated waveforms illustrated in Figures 4, 5, and 6 were approved by the WRAIR, calibration curves relating peak pressure (Pmax) to charge weight, for C-4 charge detonations ranging in size from 227 to 3175 g, for each gauge were produced.

Preliminary pressure-time measurements were also taken with the WRAIR instrumentation cylinders in the loader and gunner po-

sitions for comparison with the side-on gauges. A complete set of pressure-time recordings was taken at the end of the study with the two instrumentation cylinders using the explosive charge weights that the sheep were subjected to for correlation with the side-on gauge calibration curves. The sensing elements of the cylinder gauges were also 1.2 m from the floor.

Experimental Design

The study design is presented in Table 1. Varying numbers of anesthetized sheep were subjected to 6, 25, or 100 blasts of simulated muzzle blast waves in 1.5-dB increments. Exposure doses and charge weights were derived from the side-on pressure gauge calibration shots mentioned above. There were three sets of nonauditory injury experiments based upon whether the animals received 6, 25, or 100 blasts. The highest pressure recorded at a crew position during the actual firing of a 155mm sph was approximately 7 kPa (172 dB). A starting experimental level was set at 12 dB higher or 30 kPa (184 dB), which hopefully would produce lung injury. The plan was to work down in equal increments until subthreshold levels of injury were established for the 6-exposure experiment. There were 10 animals exposed at each pressure level except for the subthreshold points. The severity

of injury ranges were used to establish the exposure level increments. The 1.5-dB steps were based on the low incidence of injuries at the first exposure level as well as succeeding levels. The results of the 6-exposure experiments were used to establish the starting point for the 25-exposure experiments. Likewise, the results of the 25-exposure experiments were used to establish the starting point for the 100-exposure experiments. A total of 22 control animals were used in pairs at intervals throughout the study to compensate for any lesions induced by iatrogenic factors or pre-existing disease. The interval between shots was approximately 1 minute.

There were 50 test sheep used in the 6-exposure experiments. Three different peak overpressure (Pmax) exposure levels of 30, 25, and 22 kPa were employed to establish the subthreshold for six blasts. There were two groups of 10 each in the first two levels and 30 in the lower one.

To establish the subthreshold for the 25-exposure experiments, there were 30 test animals in three groups of 10 each. The Pmax levels of 25, 22, and 18.2 kPa were used.

A total of 40 test animals were used in the 100-exposure experiments. A single Pmax level of 18.2 kPa was used to estimate the subthreshold for 100 blasts.

Instrumentation

Three Piezotronics (PCB) Model 102M195 piezoelectric pressure transducers were used as side-on gauges in the crew positions illustrated in Figure 3 during the waveform and calibration curve development phase of the study. A 1- to 2-mm-thick coating of temperature-resistant high-vacuum grease impregnated with charcoal, to mitigate thermal and flash effects, was applied to the face of each gauge before a shot series. The instrumentation cylinders used in the loader and gunner crew positions during calibration were fitted with four each ablative coated PCB Model 102M125 piezoelectric transducers at 90-degree intervals around their circumferences and 7.6 cm above the midpoints of their long axes.

Instrumentation during animal testing was limited to one side-on gauge at the chief of section position shown in Figure 3 to facilitate the 1-minute interval between shot requirement. It took approximately 5 to 10 seconds to acquire and name a new shot file and 18 seconds to download one channel of digitized data to the computer. An additional 10 to 15 seconds or so was required to reset the system for the next shot.

Signals from the transducers were passed into PCB Model 464 amplifiers for conditioning. The unfiltered signals from the

amplifiers were simultaneously recorded on an Ampex Model PR2230 dc to 80 kHz FM tape recorder and digitized over 13 of 15 segments of 8k data points each at a 4-μsec sample interval with a Pacific Instruments Model 9832 transient data acquisition system operating in conjunction with a CDI 486/66 Mhz personal computer. The analog tape was kept for archival purposes. The digitized data was stored on both 20 and 44 Mbyte Bernoulli disk cartridges for analysis using the blast analysis software developed for EG&G by Professional Computer Consultants. The data stored on the 44 Mbyte disks were also sent to the WRAIR for further analysis.

Animal Care

A total of 146 female Columbia-Rambouillet cross sheep having body weights ranging from 32 to 55 kg were used during the study. They were treated for endoparasites and their ears were sprayed with tick pesticide four days after arrival at the laboratory outdoor pens. The drinking water was also treated with terramycin powder at a rate of 0.6 g/liter for 2 weeks to help reduce the incidence of pulmonary complications.

Each of the outdoor pens in which the sheep were kept had a portion of their pens with an overhead cover. One to two weeks prior to testing, the subjects were moved into indoor pens in groups of 10, given a second application of tick spray and shorn

of their wool. They were kept in groups of four to six in pens with wood shavings on the floor. Food pellets were provided at a rate of 1 kg/head/day. Water was available *ad libitum*. Each animal was fasted a minimum of 18 hours before a test.

On the morning of a test, the animals were weighed, harnessed and given an otoscopic examination to remove any obstructions from the ear canals prior to transport to the test site. The ears were then fitted with E.A.R.® foam plugs.

Each sheep received a preanesthetic intramuscular (IM) injection of atropine sulfate (0.44 mg/kg) and xylazine (0.22 mg/kg) and was placed in its test position approximately 15 minutes prior to blast exposure. At 5 minutes before the test, each sheep was anesthetized with an IM injection of Ketamine hydrochloride (11 mg/kg) then exposed to blast.[1]

Pathology Scoring

The animals were not allowed to recover from anesthesia. Starting at approximately 1 hour after blast exposure, one sheep at a time was given an IM injection of ketamine hydrochloride (22mg/kg), exsanguinated by severing the jugular veins and carotid arteries, and necropsied. Each animal was assessed for injuries by using an alphanumeric scoring code.[3] Any external

lesions, fractures, and trauma to the pharynx/larynx, trachea, lungs, heart, hollow abdominal organs, and solid abdominal organs were assigned individual numerical scores based on the severity of the lesion. These numerical values were derived from a pathology scoring system initially developed by the WRAIR in collaboration with the Lovelace Biomedical and Environmental Research Institute and is currently used in the Jaycor Pathos data base program. The various lesions were also graded as trace, slight, moderate, or extensive depending upon their severity. Each individual score was divided by its preassigned maximum possible score to arrive at a severity of injury ratio for that organ or system. The presence or absence and the extent of a pnemothorax, hemothorax, hemoperitoneum, or coronary and/or cerebral air embolism were summed and added to the sum of the ratios. The resulting value was then multiplied by 1 or 2, depending upon whether the subject was a survivor or fatality, to arrive at an Adjusted Severity of Injury Index (ASII) by excluding ear damage values from the sum of the ratios. The ASII can be expressed by the following equation:

$$ASII = (\sum Ratios + \sum Morbidity\ Factors) * (Morbidity\ Multiplier)$$

It is a useful blast effects analysis tool in that it can be used to evaluate blast injuries in terms of trauma to the whole animal as well as to individual organs.

RESULTS

The results of the waveform modeling efforts and calibration curve development will be presented first, followed by the gross pathology assessments and evaluations of the assessments. Damage to the M108 vehicle will also be briefly described.

The pressure-time data in the appendices are listed in terms of peak overpressure (Pmax) in kPa, a-duration (Ta) in ms, a-impulse in kPa*ms, total duration (Td) in ms, and smoothed-peak overpressure (Psm) in kPa as a function of charge weight. The Psm was derived from each pressure-time data array using a 351 point fixed-size moving window which corresponded to a 175 point half window on either side of the data being operated on.

Pressure-time data recorded at the crew positions during calibration are listed in Tables A-1 and A-2 of Appendix A. The individual and average values for the various instrumentation cylinder gauge calibration combinations, as well as the chief of section pressure-time associated with the cylinder shots, are listed in Table A-3.

Pathology assessments for the major organs, as well as ASII,[3] are given in Table B-1 of Appendix B. The assessments were listed in terms of numbers of exposures and in descending order of charge weight. All of the gross pathology assessments were blind but were subject to periodic review as histopathology results became available.

Pressure-time data from the gauge located in the chief of section crew position which monitored the shot-to-shot blast environment for each animal test are tabulated in Table C-1 through C-61 of Appendix C. The mean and the standard deviation for each test series are included. A table of average pressure-time values is also presented in Table C-62.

Waveform Development

As previously mentioned, the 155mm sph muzzle blast waveform that was selected for modeling is presented in Figure 2. The simulated waves recorded in the loader, gunner, and chief of section positions are illustrated in Figures 4, 5, and 6, respectively.

Calibration lines for the side-on single probe gauges relating Pmax to C-4 charge detonations ranging in size from 227 to 3175 g were produced. Linear regression analyses using the least

squares method were used to fit the lines to the data points obtained from Table A-1. The default statistic used by Excel® is the coefficient of determination, r^2, which is the ratio of the regression sum of squares divided by the total sum of squares. The regression sum of squares is the amount of variation in the predictor variable (charge weight) and the sum of squares is the amount of total variation in the response variable (pressure).

Regression lines for the side-on gauges in the three crew positions are illustrated in Figure 7. The r^2 numbers for the loader, gunner, and chief of section were 0.9757357, 0.9618463, and 0.9696261, respectively.

The composite regression line for the loader and gunner side-on gauges compared to the chief of section gauge is shown in Figure 8. An r^2 of 0.9618213 was calculated for the composite regression line. The study experimental design exposure doses were based on this composite regression line.

Calibration lines for the loader and gunner instrumentation cylinders using the four gauge average Pmax values from Table A-3, which were obtained from the individual values listed in Table A-2, were calculated and compared to the corresponding chief of section regression analyses which is shown in Figure 9. The r^2

values for the loader, gunner, and chief of section were 0.9571370, 0.9195564, and 0.8885730, respectively.

The lines illustrated in Figure 10 represent the combined average loader/gunner instrumentation cylinder values and the single side-on gauge Pmax's compared to the combined chief of section single gauge Pmax values from Figures 8 and 9. The respective r^2 values were 0.9077184, 0.9618213, and 0.9597057.

A single regression line illustrated in Figure 11 was derived from the chief of section monitor gauge average Pmax values from each animal test series list in Table C-62. The r^2 was 0.9306802.

The single regression line illustrated in Figure 11 was plotted against the calibration lines in Figure 10 for comparison to obtain Figure 12. The chief of section calibration line values and the chief of section monitor gauge values are essentially the same over the narrow range of charge weights actually used for the animal exposures.

Table 2 summarizes the equations for the regression lines displayed in Figure 12 as well as the Pmax derived from the equations for each experimental charge weight used during the sheep exposures.

Animal Response

Table 3 lists the experimental results expressed in terms of incidence of gross lesions in the major gas-containing organs, mean adjusted severity of injury indices (mean ASII), and accumulative incidence of gross lesions as a function of Pmax and number of exposures. Table 4 presents the same data in terms of the unacceptable and trivial lesion criteria as described by Dodd, et al.[4] According to the criteria, unacceptable was defined as (1) any animal in a group with pulmonary or gastrointestinal tract injury, (2) greater than 33 percent of the group's animals with slight upper respiratory tract injury, or (3) any animal in a group with moderate or severe upper respiratory tract injury. Trivial was defined as less than 34 percent of the group's animals having slight (one to four petechial hemorrhages) upper respiratory tract injury and no pulmonary or gastrointestinal injury. Injury data were derived from the gross pathology assessments presented in appendix Table B-1. The sheep exposure doses listed in Tables 3, 4, and B-1 were adjusted to reflect the instrumentation cylinder calibration equation values, not the initial experimental design single gauge calibration numbers. As seen in the tables, there were only trivial lesions and a control level mean ASII of 0.01 in the 24 kPa x 6 exposures group. There

were no lesions found in the 20 kPa x 25 exposures group and the mean ASII was 0.00. For the 20 kPa x 100 exposures animals there were only trivial upper respiratory tract lesions and a control level mean ASII of 0.01. There were only two cases of trace to slight lung hemorrhage in the experimental animals, one each in the 32 kPa and 27 kPa groups. There was also one control animal with slight lung hemorrhage.

Vehicle Damage

At various times during the course of the animal tests, every hatch latching mechanism failed and had to be repaired with stronger components. It was also not uncommon to find bolts that had vibrated loose from various items lying on the floor of the crew compartment after a test. A major failure which was repaired occurred with the separation of the commanders turret from the main turret of the M108 during 100 shot test series number T61.

DISCUSSION

The results indicate that the low incidence of lung injury in the test animals tended to be negated by the lung hemorrhage found in one of the controls. With the exception of the sheep in the 32 kPa x 6 exposure group, as indicated in Table B-1, the lesions sustained could well have been the result of iatrogenic

factors and not due to blast at all. For example, sheep 527 in the 27 kPa x 6 exposure set with slight lung hemorrhage was very agitated during the weighing and harnessing procedure running into the pen rails and scales. In addition, the animal bloated extensively during the postexposure hold and bloating is frequently complicated by aspiration pneumonitis. However, gastric contents contamination of the trachea was not noted in the pathology report. The pleuritis/pneumonitis found in control animal 525 was much the same as that in test animal 527 which consisted of a scattered pleural/subpleural petechiation with an isolated spot of parenchymal ecchymosis in one diaphragmatic lobe.

It is informative to compare the results of this study to chest wall velocity predictions in reverberant wave environments, to classical blast wave injury prediction curves, and to the results of the two previous sheep reverberant wave studies done at this laboratory which are presented in Tables 5 and 6.[5,6,7,8,9] The first study involved exposure to single bare charge detonations in three different enclosure volumes, the results of which are included in Table 5 along with the chest wall velocity and injury

curve predictions.[7] Results from the second study which simulated the firing of an antitank weapon from an enclosure are presented in Table 6.[9]

Table 5 is a comparison between the highest animal exposure dose and calculated chest wall velocity in this study and the chest wall velocity and overpressures associated with minimal levels of injury from single-exposure doses from other studies.[5,6,7] Gunner/loader instrumentation cylinder pressure-time histories from the 3310g, 32-kPa calibration level served as input to a single-degree of freedom, single-chamber thorax model to calculate the chest wall velocity.[5] The mathematical model was originally developed to measure the response of the thorax (chest wall displacement, velocity, acceleration and intrathoracic pressure) to classical Friedlander waves. It has also been used recently to predict chest wall velocities in reverberant wave environment studies done at this facility. The results from the complex reverberant wave study, indicated that there was a good correlation between the ASII (which includes lung, upper respiratory tract, gastrointestinal tract, and solid organ injuries) and the calculated peak inward chest wall velocity.[5] There was also a good correlation between these results and the previously established injury prediction curves of Bowen, et al.[6] A calcu-

lated chest wall velocity, 0.7 m/s, associated with the highest exposure group in this study was lower by a factor of 5 than the 3.6 m/s required to produce trace to slight injury from a single blast exposure in the previous reverberant wave environment study.[5,7,8]

As indicated in the table, the threshold for lung injury from a classical 22-ms positive phase duration wave predicted by the Bowen, et al. curve (long axis of the body parallel to the shock front) to be 86 kPa is approximately two and a half times higher than the highest exposure dose in these experiments. A positive phase duration of 22 ms was used for the prediction because it is the same duration as the wave used in this study. In addition, the 149 kPa Pmax (49 kPa Psm) predicted as threshold for trace to slight injuries in a complex reverberant wave environment, which uses ASII as a function of Psm, is approximately four and a half times higher than the 32 kPa dose of 6 shots and six times higher than the subthreshold for 6 shots for the 155mm sph tests.[7] It is obvious that the number of shots is an important variable with respect to injury.

Table 6 is a comparison between the results from this study and those from the previous multiple exposure experiments in which sheep were exposed to a simulated reverberant blast wave

like the one generated by a weapon fired from an enclosure.[9] The single blast results from that study compare quite favorably to the predicted thresholds listed in Table 5. The table also demonstrates that the dose required to produce unacceptable levels of injury and higher than control level ASII scores decreases with the increasing number of blasts up to a point then appears to level off between 25 and 100 exposures. For example, using Pmax as the dose, one would expect from the previous experiment no injuries or only trivial upper respiratory tract injuries from one exposure to 49 kPa and three exposures to 43 kPa. A no injury level for 12 exposures was not found. From the current experiment, one would expect no injuries or only trivial upper respiratory tract injuries from 6 exposures to 24 kPa, 25 exposures to 20 kPa, and 100 exposures to 20 kPa.

The accuracy of the ASII scoring method is dependant upon following the injury scoring guidelines and the objectivity of the scorer. This scoring approach has been in two studies involving 501 sheep.[7,9] A total of 265 test animals from the first study were used to develop the scoring system.[7] Third order polynomial regressions comparing individual injury scores of the various organs to respective ASII values for the 265 animals were done to demonstrate the interrelationship between the two. With

the exception of solid abdominal organ injury, injury scores increase as a function of increasing ASII. Coefficients of correlation for the organ versus ASII comparisons demonstrated significant x, y relationships ranging from 0.6962 to 0.9044 with the probability value for each ANOVA equal to 0.0001. Beta coefficient p values, with the exception of the x^2 coefficient for the pharynx/larynx and the x^3 coefficients for the pharynx/larynx and trachea, were 0.0053 or less.[3] The precision of the injury score measurements has not been determined but could be refined by fine tuning the scoring ranges for the various injury levels.

The sample sizes of 30 and 40 each used to establish the 6- and 100-blast subthresholds,respectively, were selected to establish a high degree of confidence in these two data points. By using an n of 30 there would be a probability of injury of 1 in 10 at the 95-percent confidence level and a probability of injury of 1 in 13.3 with an n of 40.[10]

CONCLUSIONS

Subjects could be exposed to Pmax levels consisting of 6 blasts of 27 kPa each, 25 blasts of 24 kPa each, and 100 blasts of 20 kPa each of this type of waveform and sustain only minor upper respiratory tract injuries. However, safe no-injury levels

with an occasional minor upper respiratory tract lesion would be achieved at exposure levels of no more than 6 blasts of 24 kPa each, and as many as 25 to 100 blasts of 20 kPa each. One thing that was apparent from this study is that the sheep were more blast resistant than the M108. It would probably be necessary to strengthen the equipment itself before the upper limits for nonauditory injury could be used in the design of a new howitzer.

REFERENCES

1. Thurmon JC, Kumar A, and Link RP. "Evaluation of Ketamine Hydrochloride as an Anesthetic in Sheep." J.A.V.M.A 162(4): 293-297, 1973.

2. Kumar A, et al. "Response of Goats to Ketamine Hydrochloride With and Without Premedication of Atropine, Acetylpromazine, Diazepam, or Xylazine." VM/SAC: 955-960, June 1983.

3. Yelverton JT. "Pathology Scoring System for Blast Injuries." J. of Trauma: Injury, Infection, and Critical Care 40(3): s111-s115, 1996.

4. Dodd KT, Yelverton JT, Richmond DR, Morris JR, and Ripple GR. "Nonauditory Injury Threshold for Repeated Intense Freefield Impulse Noise." J.Occup.Med. 32(3): 260-266, 1990.

5. Axelsson H and Yelverton JT. "Chest Wall Velocity as a Predictor of Nonauditory Blast Injury." J. of Trauma: Injury, Infection, and Critical Care 40(3): s31-s37, 1996.

6. Bowen IG, Fletcher ER, and Richmond DR. "Estimate of Man's Tolerance to the Direct Effects of Air Blast." Technical Progress Report No. DASA 2113, Defense Atomic Support Agency, Washington, D.C., Department of Defense, October, 1968.

7. Yelverton JT, Johnson DL, Hicks W and Doyal R. "Final Report: Blast Overpressure Studies with Animals and Man. Subtitle:

Biological Response to Complex Blast Waves." Contract No. DAMD-17-88-C-8141, U.S. Army Medical Research and Development Command, October 1993.

8. Yelverton JT, Johnson DL and Axelsson H. "Review of Nonauditory Effects of Blast Overpressure." Chapter 36, pp 447-461, *Scientific Basis of Noise-Induced Hearing Loss* (Eds Axelsson A, et al.), Thieme, New York, 1996.

9. Yelverton JT, Johnson DL, Hicks W and Doyal R. "Final Report: Blast Overpressure Studies with Animals and Man. Subtitle: Non-Auditory Damage Risk Assessment for Simulated Weapons Fired from an Enclosure." Contract No. DAMD-17-88-C-8141, U.S. Army Medical Research and Development Command, November 1993.

10. Calabro SR. *Reliability Principles and Practices*. 371 pages, McGraw-Hill Book Company, Inc., 1962.

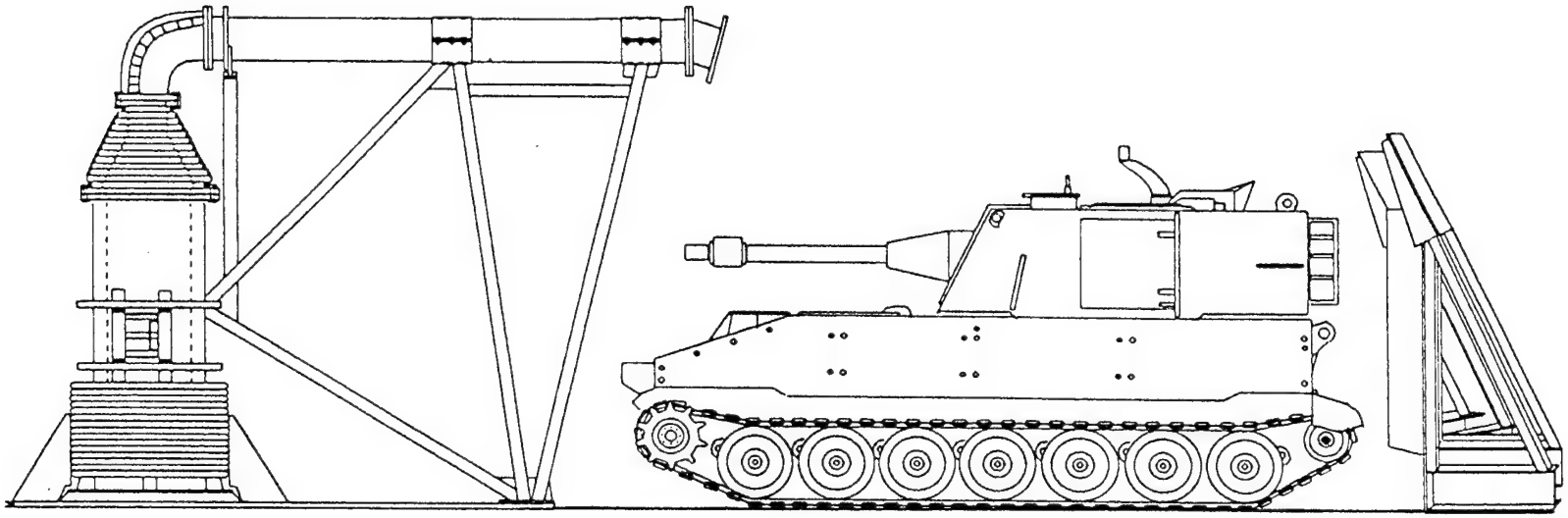


Figure 1. The M109 155mm self-propelled howitzer (sph) test array which includes the EG&G MSI Muzzle Blast Simulator, an M108 sph with back doors removed, and a blast reflector back stop.

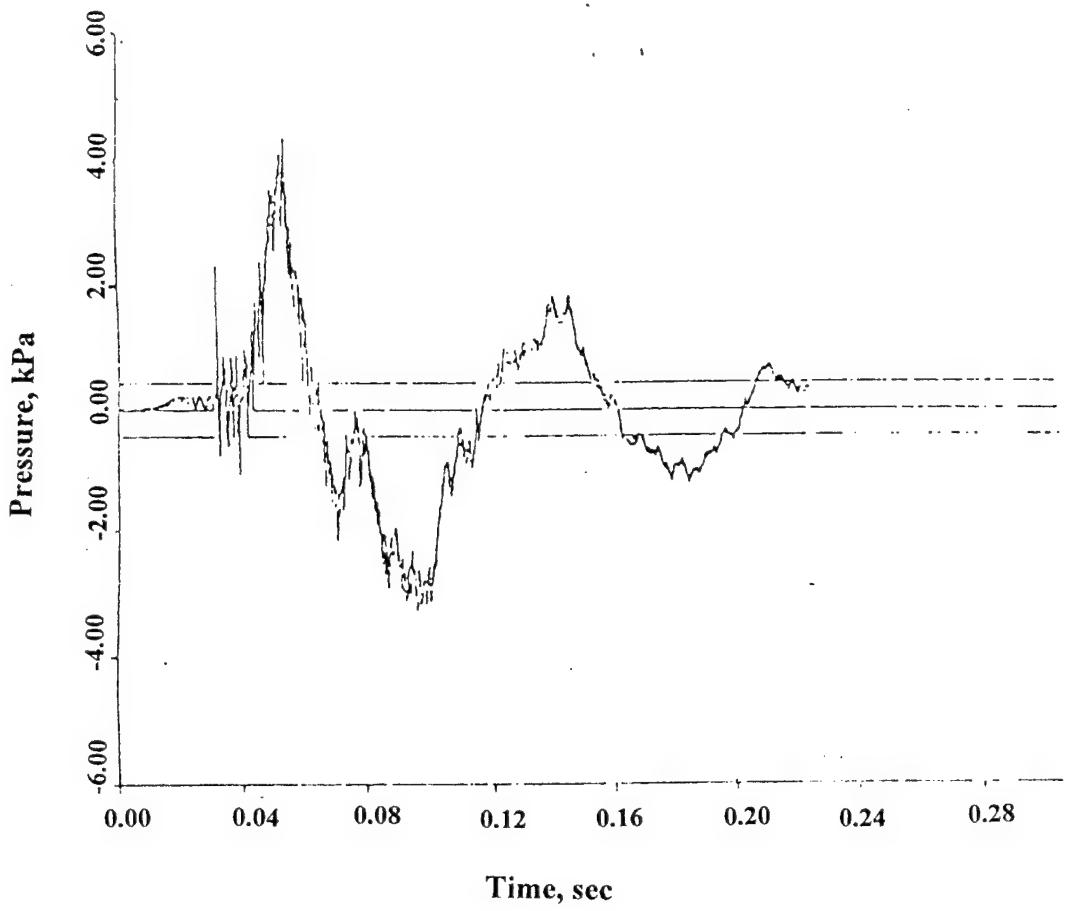
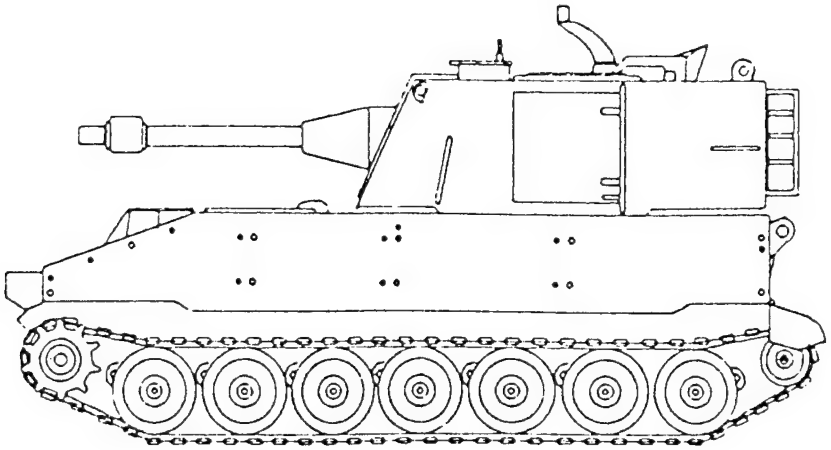


Figure 2. Pressure-time pattern recorded at the gunner position in the 155mm sph firing a zone 7R round with the barrel elevated 950 mils.



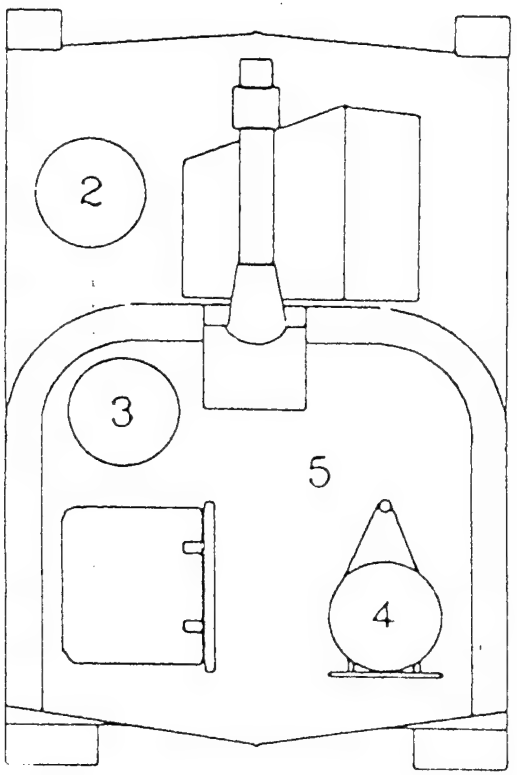


Figure 3. Test array, side and top views, of the M108 sph used to simulate the muzzle blast from an 155mm sph. Hatches were closed and rear doors were removed for testing. Position 2 was the driver; 3, the loader; 4, the chief of section; and 5, the gunner. Pressure-time instrumentation was done at positions 3, 4, and 5, respectively.

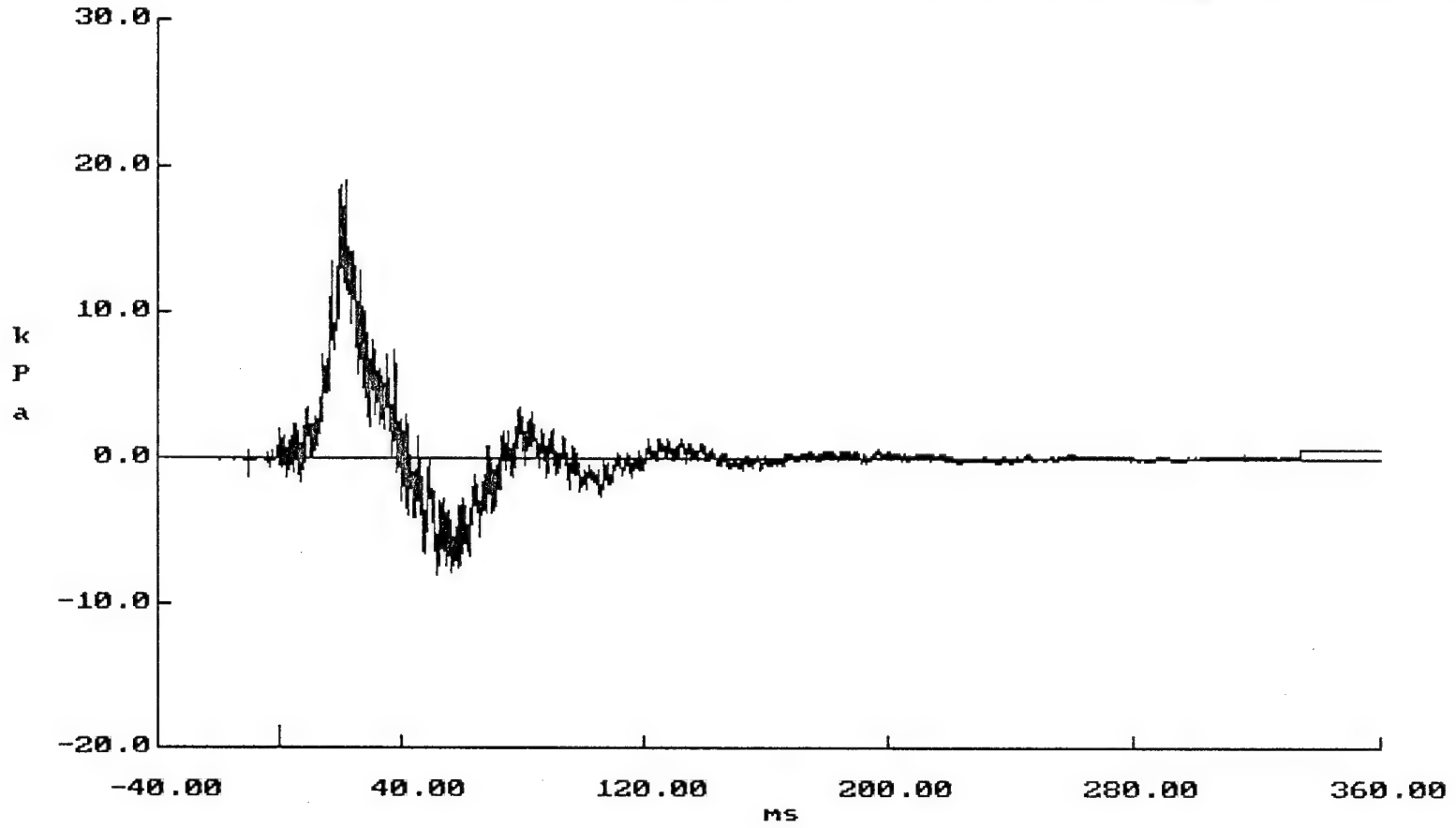


Figure 4. 155mm sph muzzle blast simulation pressure-time pattern recorded at the loader position during the firing of an 1814g C-4 charge.

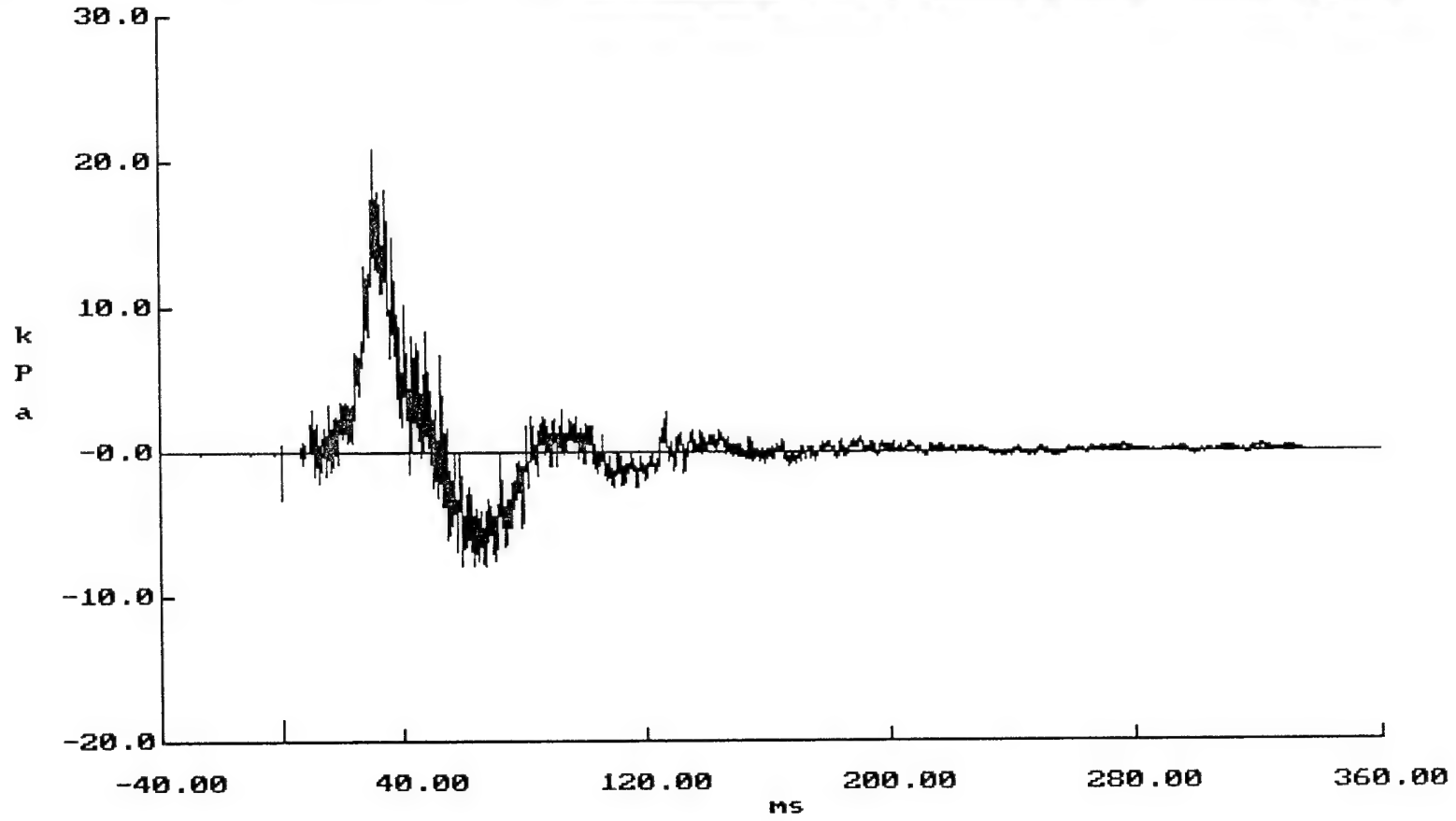
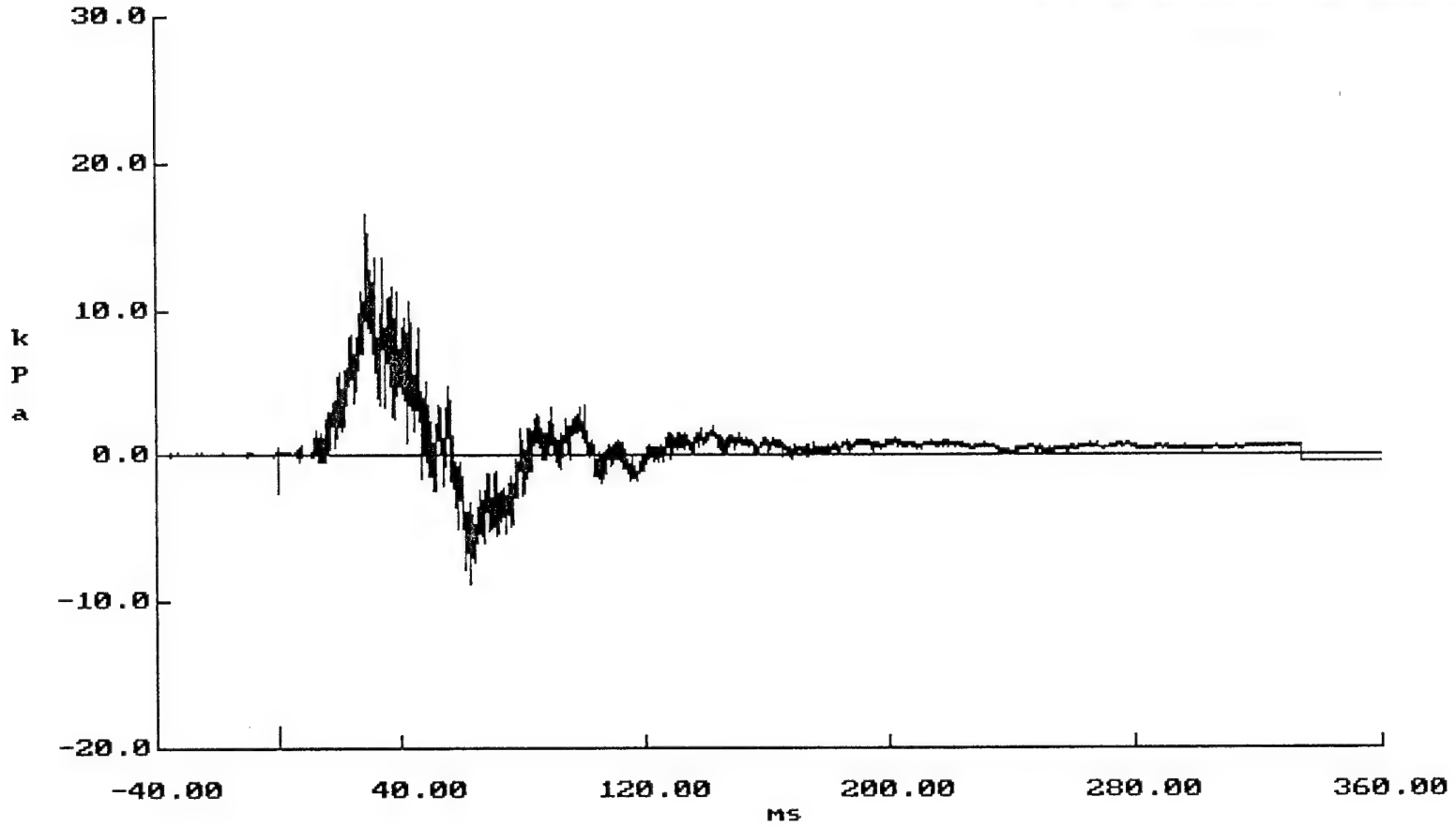


Figure 5. 155mm sph muzzle blast simulation pressure-time pattern recorded at the gunner position during the firing of an 1814g C-4 charge.



Positive peak = 16.50 kPa at 29.19 ms
Negative peak = -8.82 kPa at 62.764 ms
A Duration = 30.91 ms at 16.124 ms to 47.032 ms
B Duration = 86.06 ms
Incident peak = 3.72 kPa
Incident peak is at 18.604 ms
A Impulse = 190.44 kPa*ms
Trigger Time = 9.427872 sec

1814g C88 S10
Sect. Chief Gage 04
Mon Apr 3 14:02:34 1995

Figure 6. 155mm sph muzzle blast simulation pressure-time pattern recorded at the chief of section position during the firing of an 1814g charge.

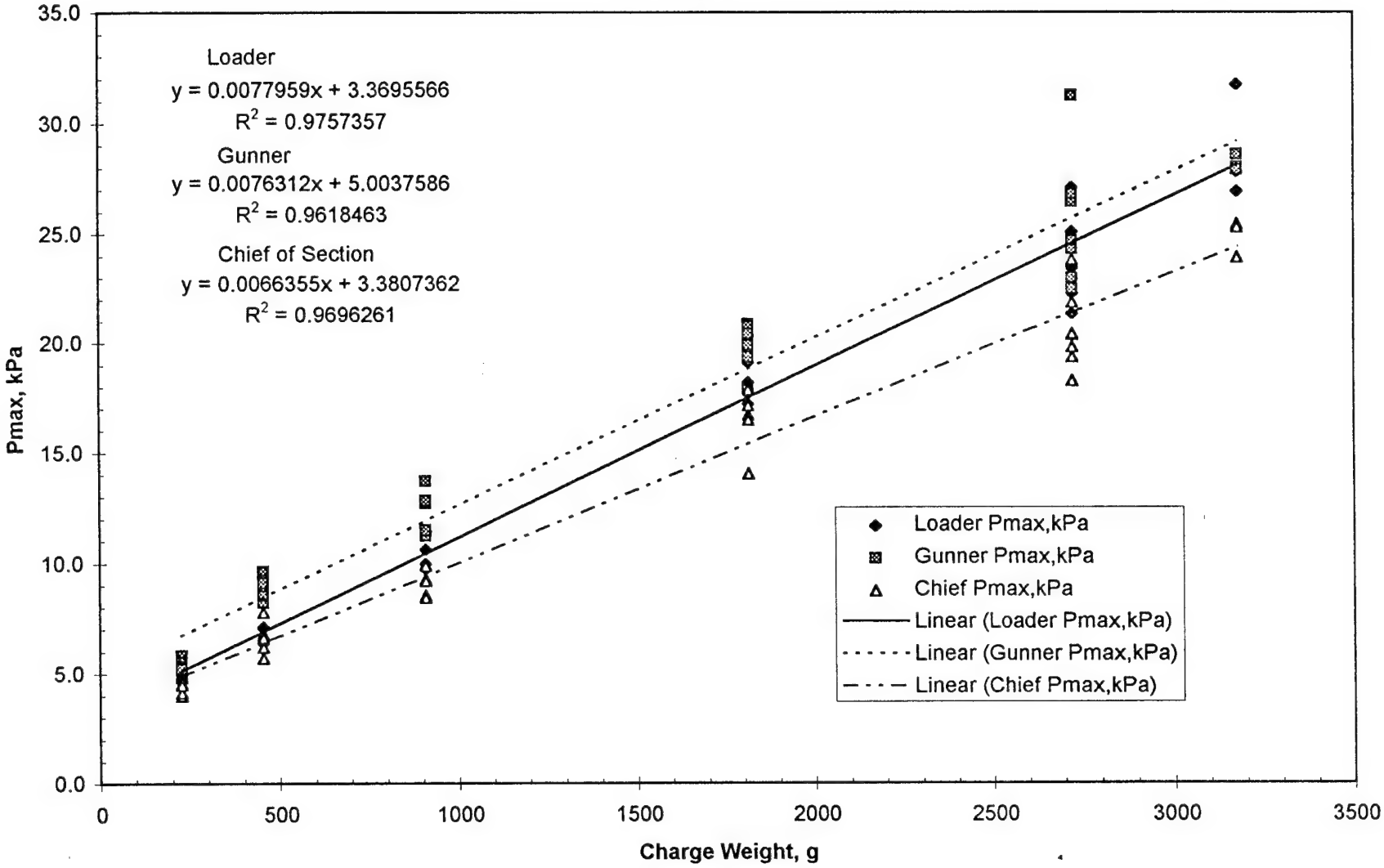


Figure 7. Linear regression analyses and comparison of the loader, gunner, and chief of section single side-on gauge 155mm sph muzzle blast simulation pressure-time values.

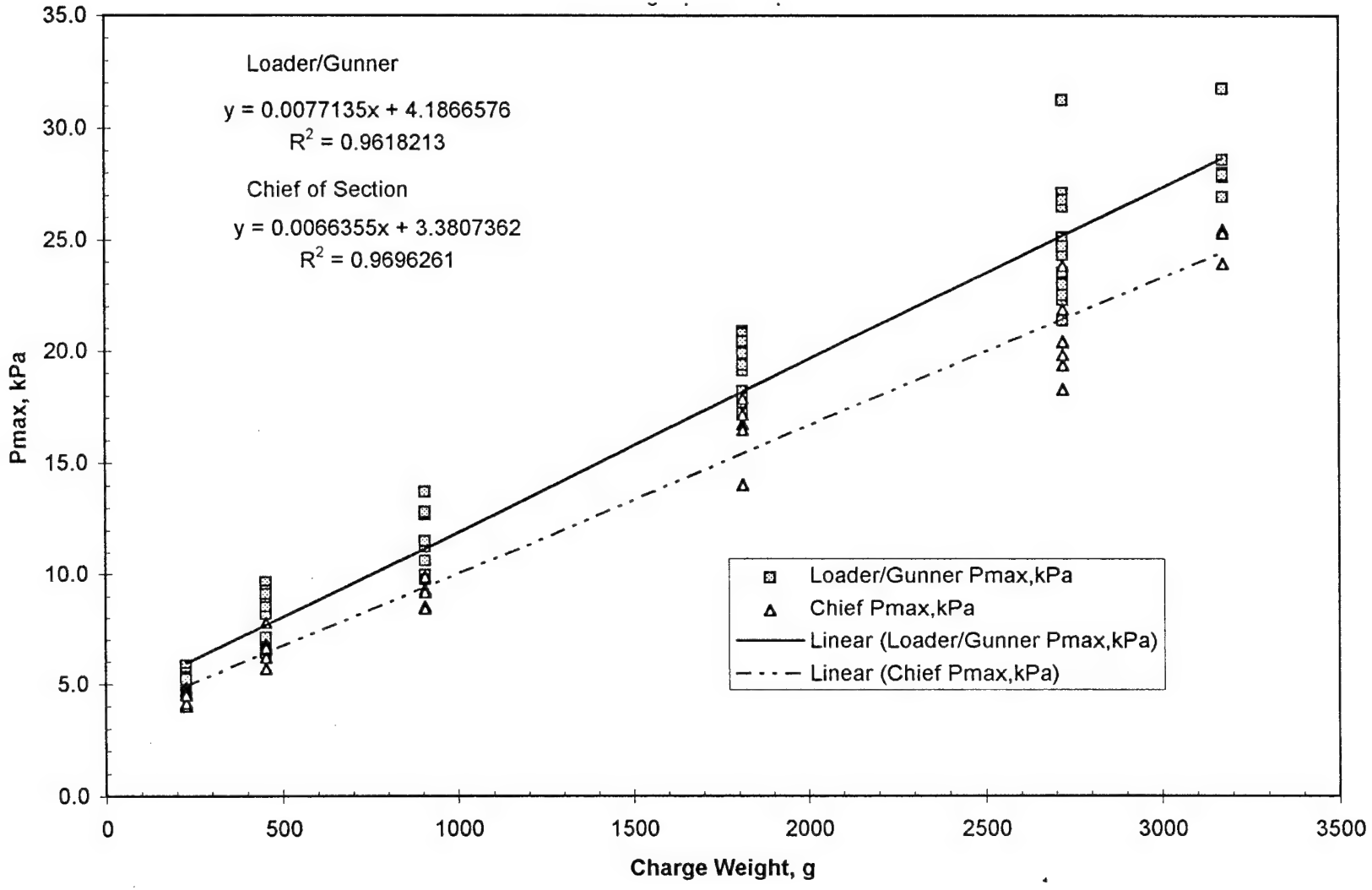


Figure 8. Linear regression analyses of the combined loader/gunner single side-on gauge 155mm sph muzzle blast simulation pressure-time values compared to chief of section.

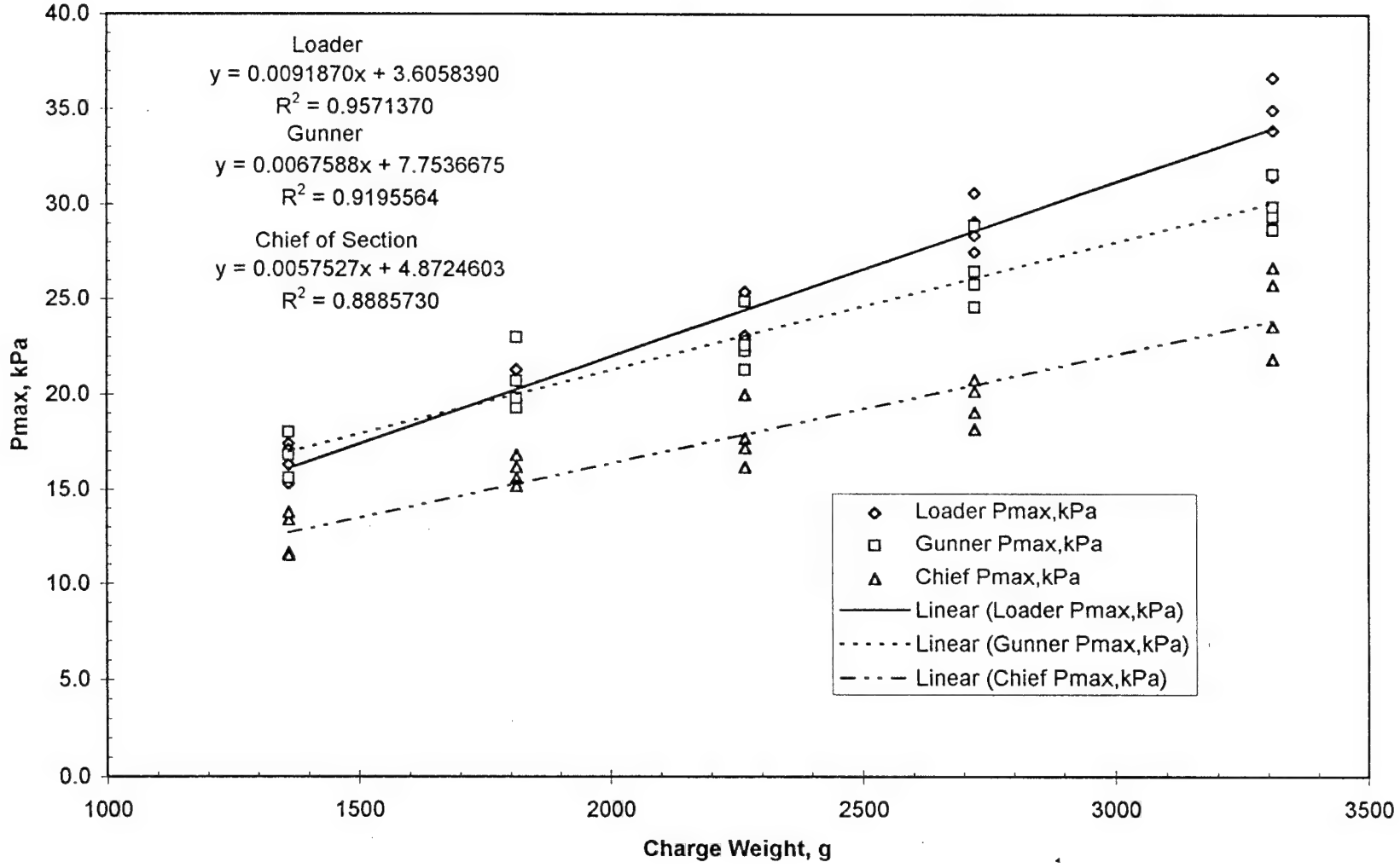


Figure 9. Linear regression analyses of the average 155mm sph muzzle blast simulation pressure-time values for the loader and gunner instrumentation cylinder versus the single side-on gauge chief of section values.

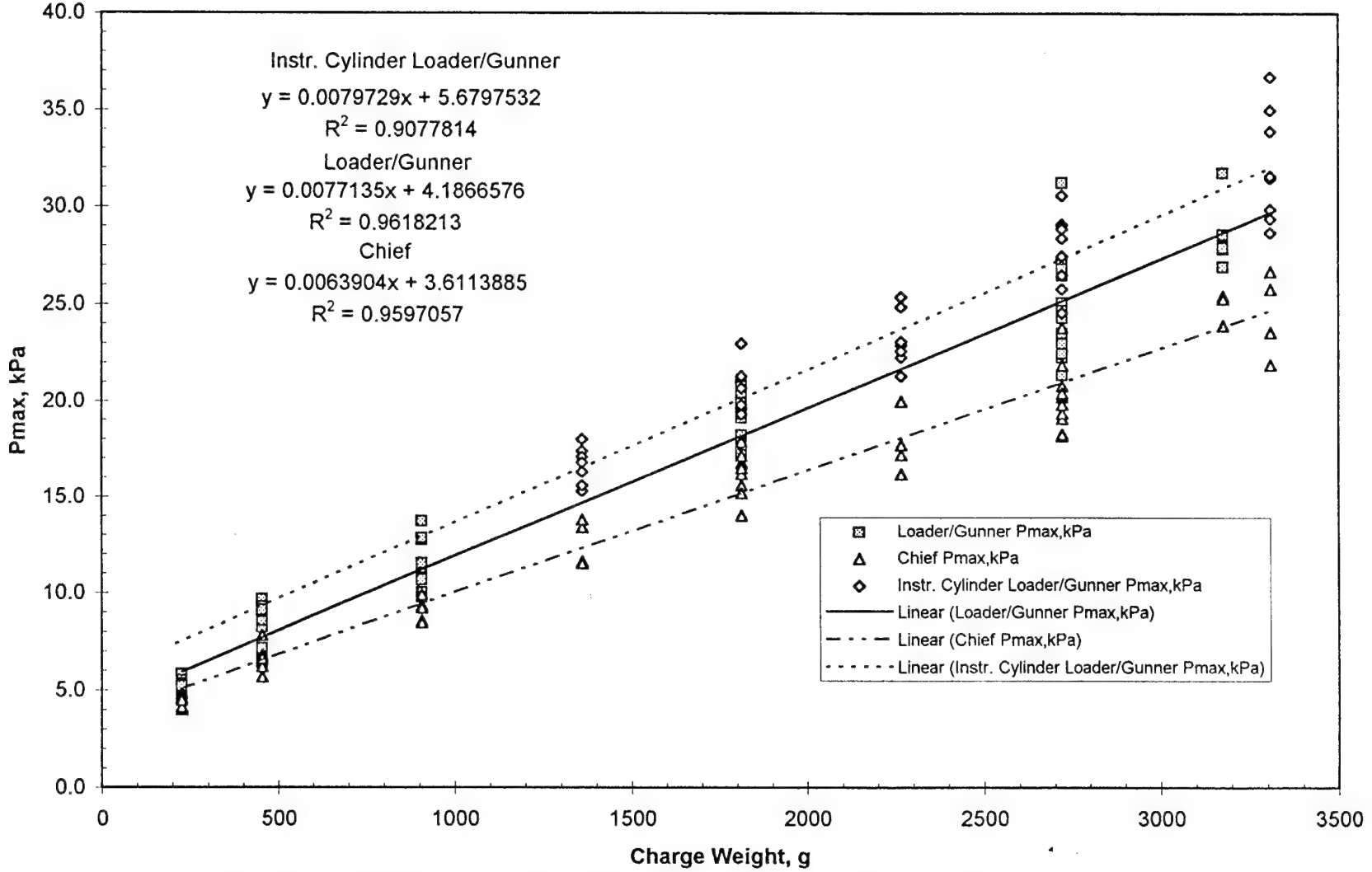


Figure 10. Linear regression analyses of the combined loader/gunner instrumentation cylinders and combined loader/gunner single side-on gauge 155mm sph muzzle blast simulation pressure-time calibration values compared to the chief of section values.

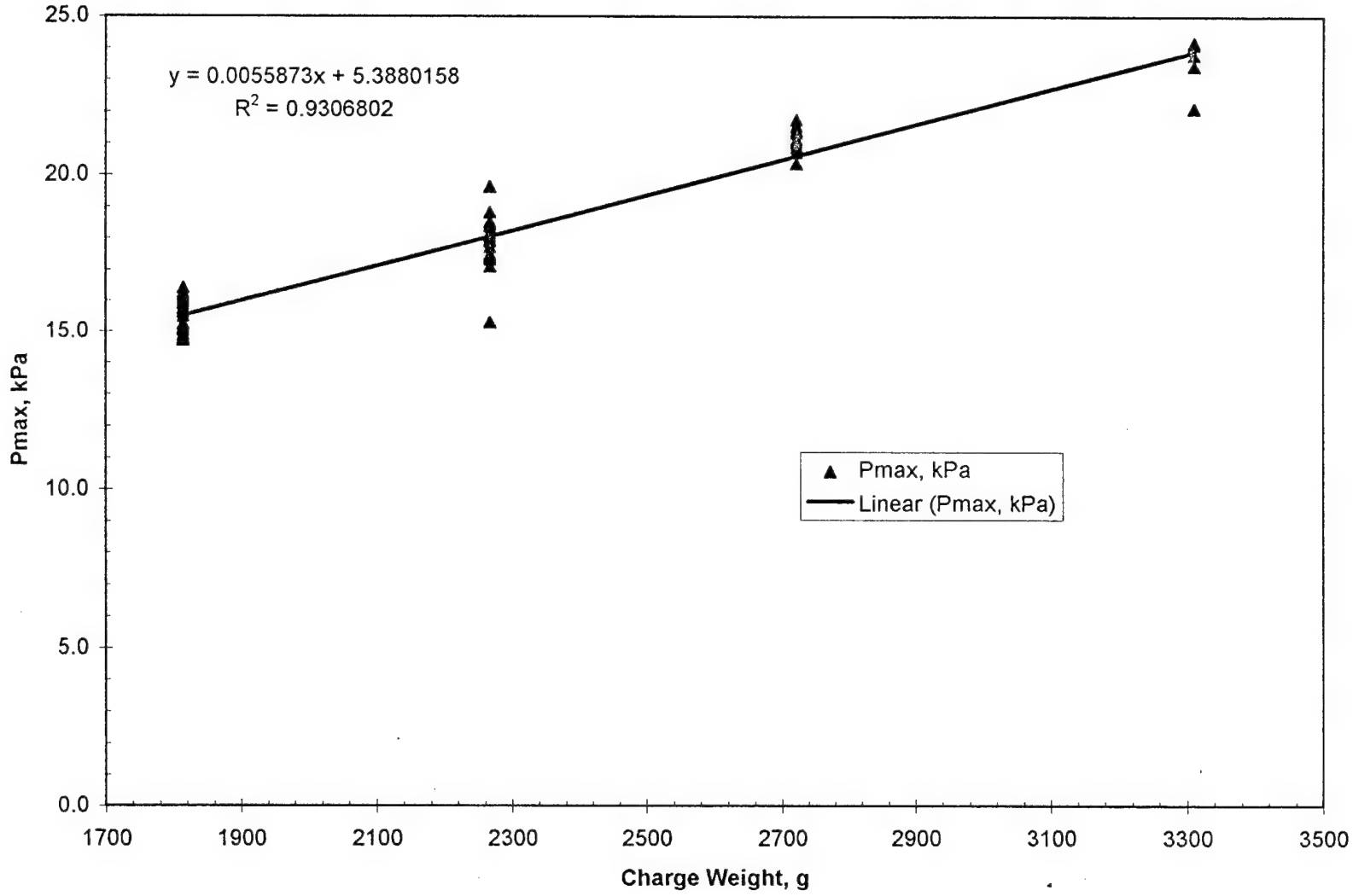


Figure 11. Linear regression analyses of the average monitor (chief of section) gauge pressure-time values for each animal test.

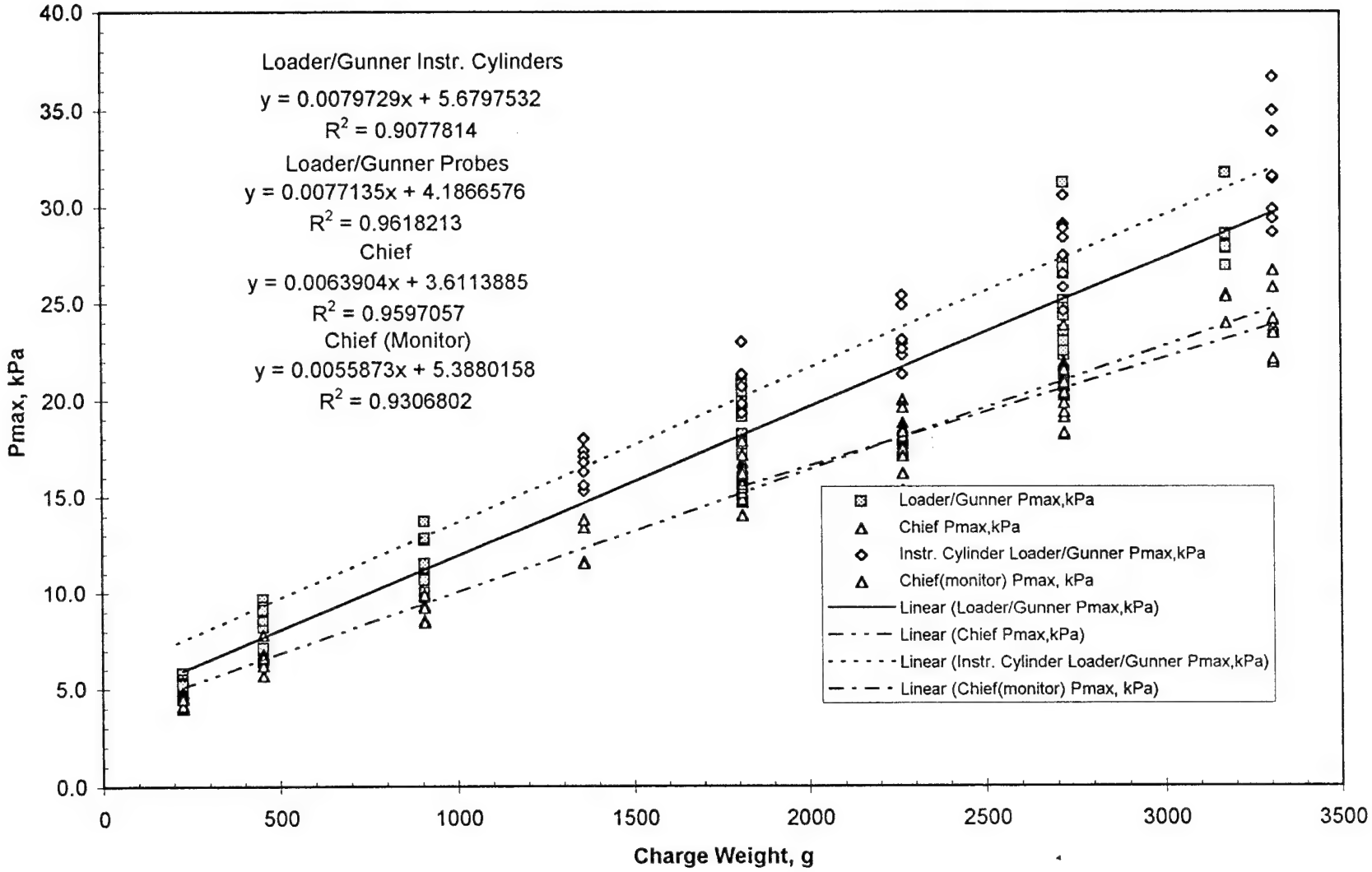


Figure 12. Linear regression analyses of the combined average loader/gunner instrument cylinder and single side-on gauge 155mm sph muzzle blast simulation pressure-time calibration values compared to the chief of section calibration and test monitor values.

Table 1. Experimental design for the 155mm sph muzzle blast simulation tests using the EG&G muzzle blast simulator.

Exposure Levels*			Number of Sheep per Experiment**		
Delta db	Pmax,*** kPa	Charge Weight, g	6 Exposure Experiment	25 Exposure Experiment	100 Exposure Experiment
0	30	3310	10		
1.5	25	2722	10	10	
3	22	2268	30	10	
4.5	18.2	1814		10	40
		Subtotals	50	30	40
		Controls	4	4	14
		Totals	54	34	54

* Exposure levels were based on the single side-on pressure gauge data presented in Figure 8. Final exposure doses listed in Tables 2, 3 and B-1 are based on the calibration data presented in Figure 12 and Table 2.

** Four animals were used in preliminary trials that are not included in the table.

***Pmax = Peak pressure

Table 2. Summary of the linear regression analyses for the various gauge calibration and test shots listed as a function of the charge weights and peak overpressures (Pmax) used in the sheep exposures during the 155mm sph muzzle blast simulation study.

Gauge Descriptions and Linear Regression Equations	x Charge Weight, g	y Pmax, kPa
Calibration loader/gunner cylinders y = 0.0079729x + 5.6797532	3310	32.1
	2722	27.4
	2268	23.8
	1814	20.1
loader/gunner y = 0.0077135x + 4.1866576	3310	29.7
	2722	25.2
	2268	21.7
	1814	18.2
chief of section y = 0.0063904x + 3.6113885	3310	24.8
	2722	21.0
	2268	18.1
	1814	15.2
Test chief of section (monitor) y = 0.0055873x + 5.3880158	3310	23.9
	2722	20.6
	2268	18.1
	1814	15.5

Table 3. Incidence of lesions, mean adjusted severity of injury index (ASII), and accumulative incidence of lesions listed as a function of peak overpressure and number of exposures in the 155mm sph muzzle blast simulation study.

Description	Incidence of Lesions				Mean	Description	Accumulative Incidence of Lesions			
kPa x reps*	Lungs	Phy/Lnyx	Trachea	GI Tract	ASII	kPa x reps*	Lungs	Phy/Lnyx	Trachea	GI Tract
32 x 6	(1/10)**	(4/10)***	(1/10)	(0/10)	0.05	32 x 6	(1/10)	(4/10)	(1/10)	(0/10)
27 x 6	(1/10)	(6/10)	(0/10)	(0/10)	0.05	27 x 6,25	(1/20)	(6/14)	(1/19)	(0/20)
24 x 6	(0/30)	(3/30)	(0/30)	(0/30)	0.01	24x 6,25	(0/40)	(3/37)	(0/40)	(0/40)
27 x 25	(0/10)	(6/10)	(1/10)	(0/10)	0.04	27 x 25	(0/10)	(6/10)	(1/10)	(0/10)
24 x 25	(0/10)	(3/10)	(0/10)	(0/10)	0.02	24 x 25	(0/10)	(3/10)	(0/10)	(0/10)
20 x 25	(0/10)	(0/10)	(0/10)	(0/10)	0.00	20 x 25,100	(0/50)	(0/43)	(0/49)	(0/40)
20 x 100	(0/40)	(7/40)	(1/40)	(0/40)	0.01	20 x 100	(0/40)	(7/40)	(1/40)	(0/40)
Controls	(1/22)	(1/22)	(0/22)	(0/22)	0.01	Controls	(1/22)	(1/22)	(0/22)	(0/22)

* Peak pressure (Pmax) in kPa times the number of exposures

** (r/n) = number of animals with lesions /sample size

***4/4 after neck exposure arrangement was improved

Note. There were no gross lung blast injuries except for possibly control level lesions in one sheep at 32 kPa x 6 and one at 27 kPa x 6 and no hemorrhages in the GI tract. The lesions to the urogenital tract were not blast induced. Any trauma to the external genitalia were contusions produced by the net harnesses that the sheep were suspended in.

Table 4. Incidence of lesions and mean adjusted severity of injury index (ASII) listed as a function of peak overpressure and number of exposures in the 155mm sph muzzle blast simulation study using trivial lesion criteria.[1]

Description kPa x reps*	Incidence of Lesions Lungs	Phy/Lnyx	Trachea	GI Tract	Mean ASII
32 x 6	(1/10)**	(4/10)***unacceptable	(1/10)	(0/10)	0.05
27 x 6	(1/10)	(6/10)unacceptable	(0/10)	(0/10)	0.05
24 x 6	(0/30)	(3/30)trivial	(0/30)	(0/30)	0.01
27 x 25	(0/10)	(6/10)unacceptable	(1/10)	(0/10)	0.04
24 x 25	(0/10)	(3/10)****unacceptable	(0/10)	(0/10)	0.02
20 x 25	(0/10)	(0/10)	(0/10)	(0/10)	0.00
20 x 100	(0/40)	(7/40)trivial	(1/40)	(0/40)	0.01
Controls	(1/22)	(1/22)trivial	(0/22)	(0/22)	0.01

[1] Dodd KT, Yelverton JT, Richmond DR, Morris JR, and Ripple GR. "Nonauditory Injury Threshold for Repeated Intense Freefield Impulse Noise". J.Occup.Med. 32(3): 260-266, 1990.

* Peak pressure (Pmax) in kPa times the number of exposures.

** (r/n) = number of animals with lesions /sample size

*** 4/4 after neck exposure arrangement was improved.

**** One animal had more than 4 petechia, which violates criteria for trivial.

Note. There are no gross lung blast injuries except for possibly control level lesions in one sheep at 32 kPa x 6 and one at 27 kPa x 6 and no hemorrhages in the GI tract. The lesions to the urogenital tract were not blast induced. Any trauma to the external genitalia were contusions produced by the net harnesses the sheep were suspended in.

Table 5. Chest wall velocity and overpressures required to produce minimal levels of injury from exposure to a 22 ms positive phase duration blast wave compared to the highest exposure level used in the 155mm sph simulation study.

Current 155 mm sph simulation				Predicted Values		
Pmax, kPa*	Psm, kPa**	Ta, ms***	Predicted Chest Wall Velocity, m/s****	Minimum Chest Wall Velocity for Trace to Slight Injury from One Exposure, m/s****	Pmax Threshold for Lung Injury from One Exposure to a 22 ms Wave,kPa*****	Pmax Threshold for Trace to Slight Injury from One Exposure, kPa ******
32	22	22	0.7	3.6	86	149*******

* Pmax = peak pressure

** Psm = smoothed peak pressure

*** Ta = A - duration

**** From (5) Axelsson H and Yelverton JT: Chest wall velocity as a predictor of nonauditory blast injury.

**** From (6) Bowen IG, Fletcher ER, Richmond DR: Estimate of man's tolerance to the direct effects of air blast.

****** From (7) Yelverton JT, Johnson DL, Hicks W and Doyal R: Biological response to complex blast waves.

******* Pmax was 174 kPa if corrected for control level lesions. Corresponding Psm values were 49 and 57 kPa respectively.

Table 6. Comparison between current 155mm sph simulation results and the Carl-Gustav simulation results.

Study	Exposure Parameters: Pmax, kPa	Exposure Parameters: Psm, kPa	Number of Exposures	Incidence of Trace to Slight Lung Injury	Incidence of Pharynx/Larynx Injury	ASII Injury Level	ASII Control Level
(1) Partial Listing	88	43	1	(1/30)*	(5/40)**unacceptable	0.05	0.03
	64	31		(1/12)	(1/12)unacceptable	0.03	
	49	23		(0/40)	(3/40)trivial	0.01	
	49	23	3	(2/10)	(2/10)trivial	0.09	0.03
	43	20		(0/40)	(2/40) trivial	0.01	
	49	23	12	(1/4)	(1/4)trivial	0.22	0.03
(2) Current Study	32	22	6	(1/10)	(4/10***)unacceptable	0.05	0.01
	27	19		(1/10)	(6/10)unacceptable	0.05	
	24	17		(0/30)	(3/30)trivial	0.01	
	27	19	25	(0/10)	(6/10)unacceptable	0.04	0.01
	24	17		(0/10)	(3/10)****unacceptable	0.02	
	20	14		(0/10)	(0/10)none	0.00	
	20	14	100	(0/40)	(7/40)trivial	0.01	0.01

(1) Yelverton JT, Johnson DL, Hicks W and Doyal R: Non-auditory damage risk assessment for simulated weapons fired from an enclosure.

(2) Yelverton JT, Johnson DL, Hicks W and Doyal R: Non-audtory damage risk assessment for simulated 155mm self-propelled howitzer muzzle blast.

* (r/n) = number of animals with lesions/sample size

** One with diffuse ecchymosis

*** 4/4 after neck exposure arrangement was improved.

**** One animal had more than 4 petechia which violated the criteria for trivial.

APPENDIX A

CALIBRATION PRESSURE-TIME VALUES

Table A-1. 155mm sph muzzle blast simulation calibration pressure-time values for the single side-on gauge positions.

Date	Shot Number	Gauge Location	Charge Weight, g	Pmax, kPa	Ta, ms	A-Impulse, kPa*ms	Td, ms	Psm, kPa
3/27/95	s01c80	(3)Loader	227	4.8	18.4	39	81.8	3.6
		(4)Chief		4.8	20.6	33	98.7	3.3
		(5)Gunner		5.8	18.3	40	95.4	3.6
	s02c80	(3)Loader		5.0	15.2	30	99.2	3.4
		(4)Chief		4.0	19.8	29	149.7	3.0
		(5)Gunner		5.3	15.7	33	97.7	3.4
	s03c80	(3)Loader		5.1	16.6	35	98.0	3.8
		(4)Chief		4.2	22.7	33	100.0	3.1
		(5)Gunner		5.5	16.0	36	93.8	3.7
3/24/95	s01c78	(3)Loader	454	6.5	14.5	48	100.0	5.1
		(4)Chief		5.7	21.1	48	149.1	4.2
		(5)Gunner		8.2	ND	ND	ND	5.6
3/27/95	s04c81	(3)Loader		6.6	15.5	51	99.6	5.0
		(4)Chief		6.7	20.5	48	147.8	4.4
		(5)Gunner		8.6	14.8	52	99.8	5.6
	s05c81	(3)Loader		7.1	16.5	52	99.4	5.4
		(4)Chief		6.8	ND	ND	99.0	4.2
		(5)Gunner		9.6	14.9	52	98.3	5.8
	s06c81	(3)Loader		7.1	15.1	49	97.3	5.0
		(4)Chief		6.2	ND	ND	147.6	4.1
		(5)Gunner		8.6	ND	ND	149.6	5.4
3/27/95	s07c82	(3)Loader	908	10.6	19.0	79	97.1	8.2
		(4)Chief		8.5	19.8	71	99.1	6.2
		(5)Gunner		12.7	18.5	80	99.9	8.4
	s08c82	(3)Loader		11.3	18.3	79	97.9	7.8
		(4)Chief		8.5	20.8	74	99.1	6.0
		(5)Gunner		11.3	ND	ND	149.2	7.9
	s09c82	(3)Loader		11.5	18.8	86	99.8	8.4
		(4)Chief		9.2	ND	ND	150.0	6.6
		(5)Gunner		11.5	ND	ND	100.0	8.7
3/27/95	s10c83	(3)Loader	1814	20.4	25.1	191	97.8	14.8
		(4)Chief		16.7	ND	ND	99.8	12.2
		(5)Gunner		20.9	23.1	182	96.1	15.7
	s11c83	(3)Loader		17.7	19.3	140	97.0	14.2
		(4)Chief		14.0	31.1	172	99.5	11.1
		(5)Gunner		17.9	23.4	159	97.2	14.7
	s12c83	(3)Loader		17.2	24.2	190	97.6	15.1
		(4)Chief		17.9	30.6	187	99.4	13.5
		(5)Gunner		19.4	26.9	195	96.4	16.0
3/24/95	s2c79	(3)Loader	2722	22.3	28.4	234	95.8	17.5
		(4)Chief		18.3	31.8	222	99.2	13.1
		(5)Gunner		24.3	23.5	209	150.0	17.6
3/27/95	s13c84	(3)Loader		27.1	28.5	264	233.8	17.7
		(4)Chief		20.4	29.8	246	95.2	15.4
		(5)Gunner		31.3	25.0	254	98.4	18.4
	s14c84	(3)Loader		22.9	27.8	267	96.1	17.3
		(4)Chief		19.4	30.4	252	98.3	15.9

Table A-1. 155mm sph muzzle blast simulation calibration pressure-time values for the single side-on gauge positions.

Date	Shot Number	Gauge Location	Charge Weight, g	Pmax, kPa	Ta, ms	A-Impulse, kPa*ms	Td, ms	Psm, kPa
		(5)Gunner		22.5	ND	ND	95.1	17.6
	s15c84	(3)Loader		23.4	24.8	239	96.0	18.9
		(4)Chief		23.8	29.8	234	92.5	16.9
		(5)Gunner		26.5	20.9	222	97.4	20.0
4/3/95	s1c85	(3)Loader	227	5.2	16.4	34	97.8	3.8
		(4)Chief		4.5	ND	ND	99.6	3.2
		(5)Gunner		5.3	ND	ND	149.2	3.7
	s2c85	(3)Loader		4.7	15.6	32	96.6	3.5
		(4)Chief		4.6	ND	ND	148.7	3.1
		(5)Gunner		5.2	ND	ND	100.0	3.5
	s3c85	(3)Loader		4.7	16.5	33	99.7	3.6
		(4)Chief		4.5	ND	ND	99.8	3.0
		(5)Gunner		5.2	ND	ND	ND	3.6
	s4c86	(3)Loader	454	6.4	17.9	56	100.0	5.4
		(4)Chief		7.8	ND	ND	149.0	5.0
		(5)Gunner		9.3	ND	ND	99.8	6.1
	s5c86	(3)Loader		6.6	15.5	47	199.3	5.0
		(4)Chief		6.6	20.1	47	149.8	4.0
		(5)Gunner		9.0	15.3	50	150.0	5.6
	s6c86	(3)Loader		6.4	15.8	49	148.8	5.0
		(4)Chief		6.6	ND	ND	148.6	4.3
		(5)Gunner		9.1	15.2	50	99.3	5.5
	s7c87	(3)Loader	908	10.0	ND	ND	100.0	8.0
		(4)Chief		9.3	ND	ND	ND	6.8
		(5)Gunner		12.8	18.2	83	99.4	8.4
	s8c87	(3)Loader		9.8	17.7	81	94.2	7.9
		(4)Chief		9.9	20.9	76	99.9	7.1
		(5)Gunner		13.7	17.3	86	99.6	8.4
	s9c87	(3)Loader		11.4	18.2	86	98.3	8.6
		(4)Chief		9.2	21.2	79	ND	7.0
		(5)Gunner		12.8	ND	ND	ND	8.9
	s10c88	(3)Loader	1814	19.1	30.2	200	98.3	15.5
		(4)Chief		16.5	30.9	190	ND	13.6
		(5)Gunner		20.8	23.7	182	99.8	16.0
	s11c88	(3)Loader		17.9	28.5	178	92.2	15.5
		(4)Chief		17.9	31.3	176	150.0	13.2
		(5)Gunner		19.9	23.7	167	ND	15.3
	s12c88	(3)Loader		18.2	28.0	180	98.0	14.9
		(4)Chief		17.2	28.7	171	149.8	13.7
		(5)Gunner		20.4	23.4	172	ND	15.4
	s13c89	(3)Loader	2722	21.4	27.5	243	99.5	17.4
		(4)Chief		19.8	31.4	237	100.0	15.1
		(5)Gunner		23.0	21.6	211	100.0	18.6
	s14c89	(3)Loader		23.5	28.2	259	150.0	18.7
		(4)Chief		20.4	31.4	247	149.8	15.1
		(5)Gunner		26.8	18.4	203	ND	19.7
	s15c89	(3)Loader		25.1	25.5	253	149.4	19.1

Table A-1. 155mm sph muzzle blast simulation calibration pressure-time values for the single side-on gauge positions.

Date	Shot Number	Gauge Location	Charge Weight, g	Pmax, kPa	Ta, ms	A-Impulse, kPa*ms	Td, ms	Psm, kPa
		(4)Chief		21.9	30.4	250	149.9	15.7
		(5)Gunner		24.7	28.3	274	100.0	19.8
	s16c90	(3)Loader	3175	27.0	27.0	289	97.8	21.8
		(4)Chief		23.9	30.2	268	149.9	17.8
		(5)Gunner		28.0	29.0	300	199.5	22.9
	s17c90	(3)Loader		27.8	27.4	295	99.2	22.2
		(4)Chief		25.5	30.6	278	200.0	19.1
		(5)Gunner		27.9	27.1	293	200.0	22.8
	s18c90	(3)Loader		31.8	25.0	283	97.0	20.1
		(4)Chief		25.3	29.7	278	99.9	17.6
		(5)Gunner		28.6	30.1	309	ND	21.0

Table A-2. 155mm sph muzzle blast simulation calibration pressure-time values for the chief of section and instrumentation cylinder gauges as a function of location, cylinder orientation and charge weight.

Shot Number	Cylinder Orientation	Gauge Location	Charge Weight, g	Pmax, kPa	Ta, ms	A-Impulse, kPa*ms	Td, ms	Psm, kPa
S01D01	0 degrees	Chief	1361	11.6	26.0	112	99.4	9.1
		Loader-RS		15.6	20.1	116	99.1	11.8
		Loader-FS		14.8	16.5	116	99.6	12.5
		Loader-LS		15.7	17.5	138	99.3	12.9
		Loader-BS		18.9	21.6	106	98.9	11.1
		Gunner-FS		14.0	16.4	113	99.3	11.8
		Gunner-LS		19.1	16.2	116	100.0	12.8
		Gunner-BS		18.8	16.4	113	ND	12.1
		Gunner-RS		15.1	ND	ND	99.4	11.7
S02D01		Chief	1361	13.4	21.2	104	98.4	9.6
		Loader-RS		17.3	17.9	119	98.2	11.8
		Loader-FS		15.2	20.0	127	99.7	12.4
		Loader-LS		16.7	19.6	145	99.7	13.1
		Loader-BS		20.3	21.3	113	84.9	11.7
		Gunner-FS		14.4	17.0	114	98.4	12.1
		Gunner-LS		20.2	ND	ND	98.6	12.6
		Gunner-BS		20.5	16.5	119	99.9	12.5
		Gunner-RS		17.0	16.3	110	99.7	11.5
S03D02		Chief	1814	15.6	32.3	176	99.6	11.4
		Loader-RS		20.0	22.0	151	94.1	13.8
		Loader-FS		19.6	16.1	141	98.8	15.8
		Loader-LS		18.0	20.8	185	99.5	15.6
		Loader-BS		25.3	21.9	147	ND	14.5
		Gunner-FS		17.0	16.2	138	98.1	14.7
		Gunner-LS		23.5	15.8	143	ND	15.4
		Gunner-BS		31.4	16.7	144	ND	15.1
		Gunner-RS		20.0	19.9	141	98.1	14.4
S04D02		Chief	1814	15.2	30.7	177	99.4	11.6
		Loader-RS		21.6	20.3	154	89.9	13.7
		Loader-FS		18.7	16.8	148	99.5	15.7
		Loader-LS		20.1	20.8	194	ND	16.0
		Loader-BS		18.0	26.5	149	91.9	10.5
		Gunner-FS		17.4	16.5	144	98.5	14.6
		Gunner-LS		21.2	ND	ND	ND	16.2
		Gunner-BS		20.8	ND	ND	100.0	13.4
		Gunner-RS		17.8	ND	ND	98.0	14.2
S05D03		Chief	2268	17.7	32.0	219	100.0	15.0
		Loader-RS		23.3	23.6	215	99.9	16.1
		Loader-FS		20.2	ND	ND	100.0	17.6
		Loader-LS		26.9	21.4	232	ND	17.8
		Loader-BS		21.3	26.9	196	95.5	13.8
		Gunner-FS		19.0	ND	ND	97.0	15.7
		Gunner-LS		23.2	ND	ND	ND	17.7
		Gunner-BS		25.4	20.6	201	98.2	16.3

Table A-2. 155mm sph muzzle blast simulation calibration pressure-time values for the chief of section and instrumentation cylinder gauges as a function of location, cylinder orientation and charge weight.

Shot Number	Cylinder Orientation	Gauge Location	Charge Weight, g	Pmax, kPa	Ta, ms	A-Impulse, kPa*ms	Td, ms	Psm, kPa
		Gunner-RS		21.4	22.8	194	94.4	15.4
S06D03		Chief	2268	16.2	31.9	201	98.2	11.8
		Loader-RS		24.4	19.3	162	94.9	14.8
		Loader-FS		19.6	ND	ND	100.0	16.8
		Loader-LS		19.5	25.8	235	ND	15.5
		Loader-BS		25.6	22.7	150	99.3	12.3
		Gunner-FS		18.4	ND	ND	97.3	16.0
		Gunner-LS		27.9	18.3	166	ND	16.3
		Gunner-BS		25.8	17.2	157	99.6	14.5
		Gunner-RS		18.2	20.3	158	99.9	14.5
S07D04		Chief	2722	20.2	31.4	260	89.6	16.4
		Loader-RS		28.6	23.1	258	95.0	19.5
		Loader-FS		25.7	23.6	274	99.2	22.0
		Loader-LS		24.9	26.4	311	ND	21.5
		Loader-BS		30.9	25.5	232	99.4	17.7
		Gunner-FS		24.6	22.0	246	96.7	20.8
		Gunner-LS		35.4	15.0	207	99.9	21.2
		Gunner-BS		31.5	20.1	243	99.6	19.2
		Gunner-RS		24.0	24.0	231	98.9	18.8
S08D04		Chief	2722	19.1	31.6	243	91.7	15.5
		Loader-RS		29.9	17.3	192	99.1	17.8
		Loader-FS		25.5	ND	ND	99.6	20.9
		Loader-LS		24.8	20.4	242	99.9	19.9
		Loader-BS		33.2	25.2	227	99.6	18.0
		Gunner-FS		21.8	18.9	207	99.4	18.6
		Gunner-LS		26.6	16.8	199	ND	18.6
		Gunner-BS		28.8	16.8	193	98.9	17.2
		Gunner-RS		21.0	ND	ND	97.4	17.5
S09D05		Chief	3310	21.9	31.0	270	99.6	16.6
		Loader-RS		28.1	17.4	213	95.1	19.5
		Loader-FS		28.6	ND	ND	97.7	23.4
		Loader-LS		26.6	19.6	268	100.0	20.6
		Loader-BS		42.6	25.4	264	97.1	21.8
		Gunner-FS		26.5	19.2	229	96.5	20.3
		Gunner-LS		31.5	ND	ND	ND	21.7
		Gunner-BS		31.9	19.8	243	98.8	17.8
		Gunner-RS		25.0	ND	ND	99.8	19.2
S10D05		Chief	3310	25.8	31.7	293	ND	18.8
		Loader-RS		38.6	21.7	279	99.1	23.0
		Loader-FS		31.6	27.9	332	96.7	26.0
		Loader-LS		27.8	22.8	318	99.8	23.0
		Loader-BS		48.8	25.3	290	95.7	26.0
		Gunner-FS		29.1	18.4	256	98.7	23.3
		Gunner-LS		35.9	21.0	289	99.9	24.9

Table A-2. 155mm sph muzzle blast simulation calibration pressure-time values for the chief of section and instrumentation cylinder gauges as a function of location, cylinder orientation and charge weight.

Shot Number	Cylinder Orientation	Gauge Location	Charge Weight, g	Pmax, kPa	Ta, ms	A-Impulse, kPa*ms	Td, ms	Psm, kPa
		Gunner-BS		31.0	19.9	268	83.4	22.4
		Gunner-RS		30.5	20.5	252	85.8	22.4
S11D06	45degrees	Chief	1361	11.5	32.3	131	97.4	9.7
		Loader-RS		ND	ND	ND	ND	ND
		Loader-FS		14.1	ND	ND	99.5	11.8
		Loader-LS		16.7	16.9	127	99.8	13.4
		Loader-BS		15.2	20.7	103	93.3	9.1
		Gunner-FS		14.7	14.8	109	97.8	11.5
		Gunner-LS		14.3	ND	ND	ND	10.0
		Gunner-BS		18.9	16.9	101	ND	10.5
		Gunner-RS		14.3	ND	ND	99.7	12.0
S12D06		Chief	1361	13.8	31.4	137	98.5	10.3
		Loader-RS		17.4	18.2	122	98.9	11.9
		Loader-FS		16.6	15.7	119	99.7	12.3
		Loader-LS		16.0	19.4	142	ND	13.8
		Loader-BS		18.2	19.8	109	89.1	10.1
		Gunner-FS		14.5	16.9	121	97.8	12.1
		Gunner-LS		17.6	16.6	114	91.3	12.2
		Gunner-BS		15.1	16.6	109	99.5	11.1
		Gunner-RS		15.3	19.7	124	99.4	12.8
S13D07		Chief	1814	16.8	31.9	170	97.9	12.7
		Loader-RS		20.8	19.5	147	100.0	14.6
		Loader-FS		19.6	17.4	151	99.8	15.1
		Loader-LS		20.4	21.3	177	99.5	16.3
		Loader-BS		18.1	20.8	132	89.6	12.2
		Gunner-FS		17.3	17.1	141	97.1	14.9
		Gunner-LS		21.6	15.8	140	ND	14.9
		Gunner-BS		21.2	15.8	126	86.4	13.3
		Gunner-RS		19.2	21.3	147	92.5	14.4
S14D07		Chief	1814	16.2	31.5	193	94.6	13.2
		Loader-RS		24.2	21.0	165	99.0	14.8
		Loader-FS		19.9	23.2	194	99.4	15.1
		Loader-LS		21.3	23.9	209	ND	16.8
		Loader-BS		19.8	27.5	179	89.9	12.8
		Gunner-FS		18.1	20.1	166	93.9	15.2
		Gunner-LS		24.8	18.0	161	ND	15.3
		Gunner-BS		21.3	21.5	161	98.6	13.3
		Gunner-RS		18.5	17.0	154	99.2	15.3
S15D08		Chief	2268	20.0	ND	ND	ND	16.1
		Loader-RS		30.4	24.1	221	ND	19.6
		Loader-FS		24.4	ND	ND	99.8	17.9
		Loader-LS		26.3	24.2	246	99.9	20.5
		Loader-BS		20.6	23.8	176	ND	12.6
		Gunner-FS		22.0	19.4	190	93.0	17.5

Table A-2. 155mm sph muzzle blast simulation calibration pressure-time values for the chief of section and instrumentation cylinder gauges as a function of location, cylinder orientation and charge weight.

Shot Number	Cylinder Orientation	Gauge Location	Charge Weight, g	Pmax, kPa	Ta, ms	A-Impulse, kPa*ms	Td, ms	Psm, kPa
		Gunner-LS		31.1	ND	ND	100.0	18.7
		Gunner-BS		24.0	ND	ND	87.6	16.8
		Gunner-RS		22.5	21.9	202	99.7	18.7
S16D08		Chief	2268	17.2	31.7	206	98.2	13.4
		Loader-RS		27.9	19.6	172	100.0	15.8
		Loader-FS		19.7	24.4	210	96.2	16.5
		Loader-LS		21.8	21.6	206	96.9	18.3
		Loader-BS		ND	ND	ND	ND	ND
		Gunner-FS		20.2	19.2	172	97.1	16.0
		Gunner-LS		25.2	14.0	142	99.8	16.3
		Gunner-BS		19.0	20.7	171	97.2	14.2
		Gunner-RS		20.7	19.8	169	95.5	16.7
S17D09		Chief	2722	20.8	31.3	250	99.7	16.1
		Loader-RS		34.9	18.5	200	99.5	19.2
		Loader-FS		28.2	16.6	206	99.2	19.9
		Loader-LS		29.1	26.9	297	96.3	22.1
		Loader-BS		30.0	22.2	216	98.2	18.2
		Gunner-FS		23.6	17.8	207	99.6	19.6
		Gunner-LS		31.7	22.1	241	99.9	19.5
		Gunner-BS		26.5	16.8	193	99.5	17.5
		Gunner-RS		24.2	23.7	231	99.7	19.5
S18D09		Chief	2722	18.2	32.0	243	99.6	14.1
		Loader-RS		33.6	25.4	243	ND	19.7
		Loader-FS		25.7	24.2	248	99.8	17.8
		Loader-LS		26.1	23.8	269	ND	20.4
		Loader-BS		30.8	21.4	204	99.5	18.3
		Gunner-FS		22.4	ND	ND	99.3	17.3
		Gunner-LS		31.6	22.4	236	99.0	19.8
		Gunner-BS		26.2	16.9	185	99.5	16.7
		Gunner-RS		22.8	22.6	216	98.2	18.6
S19D10		Chief	3310	23.6	31.0	284	100.0	18.2
		Loader-RS		38.0	22.4	277	ND	20.7
		Loader-FS		35.2	22.3	290	99.9	23.8
		Loader-LS		30.7	24.8	331	95.1	24.1
		Loader-BS		36.1	25.3	275	97.9	21.5
		Gunner-FS		29.1	21.2	267	96.3	23.3
		Gunner-LS		31.7	20.6	265	100.0	20.9
		Gunner-BS		28.9	21.5	242	99.8	18.6
		Gunner-RS		27.8	19.2	246	99.8	23.2
S20D10		Chief	3310	26.7	30.9	289	87.1	19.1
		Loader-RS		35.5	22.7	276	ND	22.7
		Loader-FS		28.8	22.6	290	98.8	22.0
		Loader-LS		32.4	28.4	351	ND	25.7
		Loader-BS		39.0	27.1	283	98.1	22.6

Table A-2. 155mm sph muzzle blast simulation calibration pressure-time values for the chief of section and instrumentation cylinder gauges as a function of location, cylinder orientation and charge weight.

Shot Number	Cylinder Orientation	Gauge Location	Charge Weight, g	Pmax, kPa	Ta, ms	A-Impulse, kPa*ms	Td, ms	Psm, kPa
		Gunner-FS		27.8	17.9	237	98.3	22.7
		Gunner-LS		34.1	21.2	276	100.0	23.6
		Gunner-BS		30.6	16.0	213	99.7	20.3
		Gunner-RS		27.0	16.5	222	98.8	23.0

Note: RS - cylinder right side
FS - cylinder front side
LS - cylinder left side
BS - cylinder back side

Table A-3. 155mm sph muzzle blast simulation calibration pressure-time values for the chief of section and instrumentation cylinder gauges as a function of mean, location, cylinder orientation and charge weight.

Shot Number	Orientat'n	Charge Weight,g	Cylinder Pressures					(3)Wand Chief Pmax,kPa
			Gage	Loader Pmax,kPa	Gage	Gunner Pmax,kPa	L-G Difference	
S01D01	0 deg	1361	RS	15.6	RS	15.1	0.5	11.6
			FS	14.8	FS	14.0	0.8	
			LS	15.7	LS	19.1	-3.4	
			BS	18.9	BS	18.8	0.1	
Mean				16.3		16.8	-0.5	
S02D01		1361	RS	17.2	RS	17.0	0.2	13.4
			FS	15.2	FS	14.4	0.8	
			LS	16.7	LS	20.2	-3.5	
			BS	20.3	BS	20.5	-0.2	
Mean				17.4		18.0	-0.7	
S03D02		1814	RS	20.0	RS	20.0	0.0	15.6
			FS	19.6	FS	17.0	2.6	
			LS	18.0	LS	23.5	-5.5	
			BS	25.3	BS	31.4	-6.1	
Mean				20.7		23.0	-2.3	
S04D02		1814	RS	21.6	RS	17.8	3.8	15.2
			FS	18.7	FS	17.4	1.3	
			LS	20.1	LS	21.2	-1.1	
			BS	18.0	BS	20.8	-2.8	
Mean				19.6		19.3	0.3	
S05D03		2268	RS	23.3	RS	21.4	1.9	17.7
			FS	20.2	FS	19.0	1.2	
			LS	26.9	LS	23.2	3.7	
			BS	21.3	BS	25.4	-4.1	
Mean				22.9		22.3	0.7	
S06D03		2268	RS	24.4	RS	18.2	6.2	16.2
			FS	19.6	FS	18.4	1.2	
			LS	19.5	LS	27.9	-8.4	
			BS	25.6	BS	25.8	-0.2	
Mean				22.3		22.6	-0.3	
S07D04		2722	RS	28.6	RS	24.0	4.6	20.2
			FS	25.7	FS	24.6	1.1	
			LS	24.9	LS	35.4	-10.5	
			BS	30.9	BS	31.5	-0.6	
Mean				27.5		28.9	-1.4	
S08D04		2722	RS	29.9	RS	21.0	8.9	19.1
			FS	25.5	FS	21.8	3.7	

Table A-3. 155mm sph muzzle blast simulation calibration pressure-time values for the chief of section and instrumentation cylinder gauges as a function of mean, location, cylinder orientation and charge weight.

Shot Number	Orientat'n	Charge Weight,g	Cylinder Pressures					(3)Wand
			Gage	Loader Pmax,kPa	Gage	Gunner Pmax,kPa	L-G Difference	Chief Pmax,kPa
			LS	24.8	LS	26.6	-1.8	
			BS	33.2	BS	28.8	4.4	
Mean				28.4		24.6	3.8	
S09D05		3310	RS	28.1	RS	25.0	3.1	21.9
			FS	28.6	FS	26.5	2.1	
			LS	26.6	LS	31.5	-4.9	
			BS	42.6	BS	31.9	10.7	
Mean				31.5		28.7	2.8	
S10D05		3310	RS	38.6	RS	30.5	8.1	25.8
			FS	31.6	FS	29.1	2.5	
			LS	27.8	LS	35.9	-8.1	
			BS	48.8	BS	31.0	17.8	
Mean				36.7		31.6	5.1	
S11D06	45deg	1361	RS	ND	RS	18.9	ND	11.5
			FS	14.1	FS	14.3	-0.2	
			LS	16.7	LS	14.7	2.0	
			BS	15.2	BS	14.3	0.9	
Mean				15.3		15.6	0.9	
S12D06		1361	RS	17.4	RS	15.1	2.3	13.8
			FS	16.6	FS	15.3	1.3	
			LS	16.0	LS	14.5	1.5	
			BS	18.2	BS	17.6	0.6	
Mean				17.1		15.6	1.4	
S13D07		1814	RS	20.8	RS	21.2	-0.4	16.8
			FS	19.6	FS	19.2	0.4	
			LS	20.4	LS	17.3	3.1	
			BS	18.1	BS	21.6	-3.5	
Mean				19.7		19.8	-0.1	
S14D07		1814	RS	24.2	RS	21.3	2.9	16.2
			FS	19.9	FS	18.5	1.4	
			LS	21.3	LS	18.1	3.2	
			BS	19.8	BS	24.8	-5.0	
Mean				21.3		20.7	0.6	
S15D08		2268	RS	30.4	RS	24.0	6.4	20.0
			FS	24.4	FS	22.5	1.9	
			LS	26.3	LS	22.0	4.3	
			BS	20.6	BS	31.1	-10.5	

Table A-3. 155mm sph muzzle blast simulation calibration pressure-time values for the chief of section and instrumentation cylinder gauges as a function of mean, location, cylinder orientation and charge weight.

Shot Number	Orientat'n	Charge Weight,g	Cylinder Pressures: Gage	Loader Pmax,kPa	Gage	Gunner Pmax,kPa	L-G Difference	(3)Wand Chief Pmax,kPa
Mean				25.4		24.9	0.5	
S16D08		2268	RS	27.9	RS	19.0	8.9	17.2
			FS	19.7	FS	20.7	-1.0	
			LS	21.8	LS	20.2	1.6	
			BS	ND	BS	25.2	ND	
Mean				23.1		21.3	3.2	
S17D09		2722	RS	34.9	RS	26.5	8.4	20.8
			FS	28.2	FS	24.2	4.0	
			LS	29.1	LS	23.6	5.5	
			BS	30.0	BS	31.7	-1.7	
Mean				30.6		26.5	4.1	
S18D09		2722	RS	33.6	RS	26.2	7.4	18.2
			FS	25.7	FS	22.8	2.9	
			LS	26.1	LS	22.4	3.7	
			BS	30.8	BS	31.6	-0.8	
Mean				29.1		25.8	3.3	
S19D10		3310	RS	38.0	RS	28.9	9.1	23.6
			FS	35.2	FS	27.8	7.4	
			LS	30.7	LS	29.1	1.6	
			BS	36.1	BS	31.7	4.4	
Mean				35.0		29.4	5.6	
S20D10		3310	RS	35.5	RS	30.6	4.9	26.7
			FS	28.8	FS	27.0	1.8	
			LS	32.4	LS	27.8	4.6	
			BS	39.0	BS	34.1	4.9	
Mean				33.9		29.9	4.1	

Note: RS - cylinder right side
FS - cylinder front side
LS - cylinder left side
BS - cylinder back side

APPENDIX B

PATHOLOGY RESULTS

Table B-1. 155mm sph muzzle blast simulation gross pathology results listed as a function of charge weight and number of exposures.

Date	Pmax, kPa	Config-uration	Animal Number	Charge Weight,g	LW/BW, %	Lungs		Pharynx/ Larynx		Trachea		GI Tract		Solid Abd. Organs		Adj.Sev. Inj. Index	Notes
Pathology Results for Six Exposures																	
1/19/95	19	Loader	502	3629(a)	0.82	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0	
1/19/95	19	Gunner	503	3629(a)	0.82	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0	
1/20/95	19	Loader	504	3629(a)	1.07	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0	
1/20/95	19	Gunner	505	3629(a)	0.98	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0	
Mean					0.92		0.0		0.0		0.0		0.0		0.0	0.00	
SD					0.12		0.0		0.0		0.0		0.0		0.0	0.00	
SE					0.06		0.0		0.0		0.0		0.0		0.0	0.00	
4/20/95	32	Loader	508	3310	1.12	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0	(b)
4/20/95	32	Gunner	509	3310	0.87	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0	(b)
4/25/95	32	Loader	510	3310	0.73	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0	
4/25/95	32	Gunner	511	3310	0.81	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0	
4/27/95	32	Loader	512	3310	0.89	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0	(b)
4/27/95	32	Gunner	513	3310	0.88	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0	(b)
5/2/95	32	Loader	514	3310	0.94	Negative	0	Slight	5	Negative	0	Negative	0	Negative	0	0.08	
5/2/95	32	Gunner	515	3310	0.98	Negative	0	Trace	3	Slight	7	Negative	0	Negative	0	0.18	
5/4/95	32	Loader	516	3310	0.88	Trace	4	Trace	4	Negative	0	Negative	0	Negative	0	0.13	
5/4/95	32	Gunner	517	3310	0.82	Negative	0	Slight	7	Negative	0	Negative	0	Negative	0	0.12	
Mean					0.89		0.4		1.9		0.7		0.0		0.0	0.05	
SD					0.11		1.3		2.6		2.2		0.0		0.0	0.07	
SE					0.03		0.4		0.8		0.7		0.0		0.0	0.02	
5/11/95	27	Loader	520	2722	0.87	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(c)
5/11/95	27	Gunner	521	2722	0.83	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
5/16/95	27	Loader	522	2722	0.81	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
5/16/95	27	Gunner	523	2722	0.87	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(c)
5/18/95	27	Loader	524	2722	0.84	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(c,d)
5/18/95	27	Gunner	525	2722	0.90	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
5/23/95	27	Loader	526	2722	0.78	Negative	0	Trace	4	Negative	0	Negative	0	Negative	0	0.07	(e,f)
5/23/95	27	Gunner	527	2722	0.83	Slight	10	Trace	4	Negative	0	Negative	0	Negative	0	0.22	(f,g)
5/30/95	27	Loader	530	2722	0.92	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
5/30/95	27	Gunner	531	2722	0.91	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(c)
Mean					0.86		1.0		2.0		0.0		0.0		0.0	0.05	
SD					0.05		3.2		1.8		0.0		0.0		0.0	0.07	
SE					0.01		1.0		0.6		0.0		0.0		0.0	0.02	
6/1/95	24	Loader	532	2268	0.87	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
6/1/95	24	Gunner	533	2268	0.83	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
6/6/95	24	Loader	534	2268	0.77	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
6/6/95	24	Gunner	535	2268	0.76	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	

Table B-1. 155mm sph muzzle blast simulation gross pathology results listed as a function of charge weight and number of exposures.

Date	Pmax, kPa	Config-uration	Animal Number	Charge Weight,g	LW/BW, %	Lungs		Pharynx/ Larynx		Trachea		GI Tract		Solid Abd. Organs		Adj.Sev. Inj. Index	Notes
6/8/95	24	Loader	536	2268	0.86	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(b,c)
6/8/95	24	Gunner	537	2268	0.87	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
6/13/95	24	Loader	538	2268	0.88	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b,j,k)
6/13/95	24	Gunner	539	2268	0.98	Negative	0	Trace	4	Negative	0	Negative	0	Negative	0	0.07	(b)
6/15/95	24	Loader	540	2268	0.81	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
6/15/95	24	Gunner	541	2268	0.79	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
8/15/95	24	Loader	568	2268	1.00	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
8/15/95	24	Gunner	569	2268	0.90	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
8/22/95	24	Loader	572	2268	0.93	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
8/22/95	24	Gunner	573	2268	1.11	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
8/29/95	24	Loader	576	2268	1.12	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
8/29/95	24	Gunner	577	2268	0.95	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
9/5/95	24	Loader	580	2268	1.21	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
9/5/95	24	Gunner	581	2268	0.95	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
9/12/95	24	Loader	584	2268	1.17	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b,t)
9/12/95	24	Gunner	585	2268	0.78	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
11/9/95	24	Loader	604	2268	1.20	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(z)
11/9/95	24	Gunner	605	2268	0.89	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
11/16/95	24	Loader	608	2268	0.95	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
11/16/95	24	Gunner	609	2268	1.05	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
11/30/95	24	Loader	614	2268	0.89	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
11/30/95	24	Gunner	615	2268	0.88	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
12/7/95	24	Loader	618	2268	1.09	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(aa)
12/7/95	24	Gunner	619	2268	0.97	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
12/14/95	24	Gunner	622	2268	1.01	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
12/14/95	24	Gunner	623	2268	0.98	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
Mean					0.95		0.0		0.3		0.0		0.0		0.0	0.01	
SD					0.13		0.0		1.0		0.0		0.0		0.0	0.02	
SE					0.02		0.0		0.2		0.0		0.0		0.0	0.00	
Pathology Results For Twenty-five Exposures																	
10/5/95	27	Loader	592	2722	1.05	Negative	0	Slight	5	Negative	0	Negative	0	Negative	0	0.08	(b,v,w)
10/5/95	27	Gunner	593	2722	1.03	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(b.w)
10/10/95	27	Loader	594	2722	0.95	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
10/10/95	27	Gunner	595	2722	1.02	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(c)
10/17/95	27	Loader	596	2722	0.94	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
10/17/95	27	Gunner	597	2722	0.97	Negative	0	Trace	4	Slight	5	Negative	0	Negative	0	0.16	(x)
10/19/95	27	Loader	598	2722	1.10	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
10/19/95	27	Gunner	599	2722	0.90	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	

Table B-1. 155mm sph muzzle blast simulation gross pathology results listed as a function of charge weight and number of exposures.

Date	Pmax, kPa	Config-uration	Animal Number	Charge Weight,g	LW/BW, %	Lungs		Pharynx/ Larynx		Trachea		GI Tract		Solid Abd. Organs		Adj.Sev. Inj. Index	Notes
10/24/95	27	Loader	600	2722	1.01	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(o)
10/24/95	27	Gunner	601	2722	1.04	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(y)
Mean					1.00		0.0		2.1		0.5		0.0		0.0	0.04	
SD					0.06		0.0		1.9		1.6		0.0		0.0	0.05	
SE					0.02		0.0		0.6		0.5		0.0		0.0	0.02	
6/22/95	24	Loader	544	2268	0.79	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
6/22/95	24	Gunner	545	2268	1.05	Negative	0	Trace	4	Negative	0	Negative	0	Negative	0	0.07	(b)
6/27/95	24	Loader	546	2268	0.84	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(b,L)
6/27/95	24	Gunner	547	2268	0.85	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
6/29/95	24	Loader	548	2268	0.82	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
6/29/95	24	Gunner	549	2268	0.84	Negative	0	(m)	0	Negative	0	Negative	0	Negative	0	0.00	(b,m)
7/6/95	24	Loader	550	2268	0.86	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(n)
7/6/95	24	Gunner	551	2268	0.86	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
7/18/95	24	Loader	552	2268	0.84	Negative	0	Slight	5	Negative	0	Negative	0	Negative	0	0.08	(b)
7/18/95	24	Gunner	553	2268	0.88	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
Mean					0.86		0.0		1.2		0.0		0.0		0.0	0.02	
SD					0.07		0.0		2.0		0.0		0.0		0.0	0.03	
SE					0.02		0.0		0.6		0.0		0.0		0.0	0.01	
7/25/95	20	Loader	556	1814	0.95	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
7/25/95	20	Gunner	557	1814	0.81	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b,o)
7/27/95	20	Loader	558	1814	0.90	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
7/27/95	20	Gunner	559	1814	0.90	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
8/1/95	20	Loader	560	1814	1.05	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b,p)
8/1/95	20	Gunner	561	1814	0.98	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
8/3/95	20	Loader	562	1814	0.80	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
8/3/95	20	Gunner	563	1814	0.90	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
8/8/95	20	Loader	564	1814	0.86	Negative	0	(q)	0	Negative	0	Negative	0	Negative	0	0.00	(b,q)
8/8/95	20	Gunner	565	1814	0.89	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
Mean					0.90		0.0		0.0		0.0		0.0		0.0	0.00	
SD					0.08		0.0		0.0		0.0		0.0		0.0	0.00	
SE					0.02		0.0		0.0		0.0		0.0		0.0	0.00	
Pathology Results For 100 Exposures																	
8/17/95	20	Loader	570	1814	1.19	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b,r)
8/17/95	20	Gunner	571	1814	1.20	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
8/24/95	20	Loader	574	1814	0.89	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
8/24/95	20	Gunner	575	1814	1.10	Negative	0	Negative	0	Slight	5	Negative	0	Negative	0	0.09	
9/7/95	20	Loader	582	1814	1.05	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
9/7/95	20	Gunner	583	1814	1.14	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	

Table B-1. 155mm sph muzzle blast simulation gross pathology results listed as a function of charge weight and number of exposures.

Date	Pmax, kPa	Config-uration	Animal Number	Charge Weight,g	LW/BW, %	Lungs		Pharynx/ Larynx		Trachea		GI Tract		Solid Abd. Organs		Adj.Sev. Inj. Index	Notes
9/14/95	20	Loader	586	1814	0.95	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
9/14/95	20	Gunner	587	1814	0.99	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
9/21/95	20	Loader	590	1814	0.98	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b,u)
9/21/95	20	Gunner	591	1814	1.31	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
11/14/95	20	Loader	606	1814	1.08	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(b)
11/14/95	20	Gunner	607	1814	1.02	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(b)
11/21/95	20	Loader	610	1814	0.89	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
11/21/95	20	Gunner	611	1814	1.09	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
11/29/95	20	Loader	612	1814	1.09	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
11/29/95	20	Gunner	613	1814	0.99	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
12/5/95	20	Loader	616	1814	1.13	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
12/5/95	20	Gunner	617	1814	0.97	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
12/12/95	20	Loader	620	1814	0.91	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
12/12/95	20	Gunner	621	1814	0.93	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
12/19/95	20	Loader	624	1814	1.16	Negative	0	Trace	4	Negative	0	Negative	0	Negative	0	0.07	(bb)
12/19/95	20	Gunner	625	1814	1.03	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
1/9/96	20	Loader	628	1814	0.99	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
1/9/96	20	Gunner	629	1814	0.90	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
1/16/96	20	Loader	630	1814	1.06	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	b,cc)
1/16/96	20	Gunner	631	1814	1.09	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(b,dd)
2/1/96	20	Loader	632	1814	1.13	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
2/1/96	20	Gunner	633	1814	0.85	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(ff)
2/6/96	20	Loader	634	1814	1.13	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
2/6/96	20	Gunner	635	1814	1.14	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
2/13/96	20	Loader	636	1814	1.08	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(gg)
2/13/96	20	Gunner	637	1814	1.05	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
2/20/96	20	Loader	638	1814	0.89	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
2/20/96	20	Gunner	639	1814	0.92	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(hh)
2/29/96	20	Loader	640	1814	1.03	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(ii,jj,kk)
2/29/96	20	Gunner	641	1814	1.02	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
3/12/96	20	Loader	644	1814	1.16	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
3/12/96	20	Gunner	645	1814	1.18	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.05	(b)
3/19/96	20	Gunner	646	1814	1.06	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
3/19/96	20	Gunner	647	1814	0.97	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(o)
Mean					1.04		0.0		0.6		0.1		0.0		0.0	0.01	
SD					0.10		0.0		1.2		0.8		0.0		0.0	0.02	
SE					0.02		0.0		0.2		0.1		0.0		0.0	0.00	

Table B-1. 155mm sph muzzle blast simulation gross pathology results listed as a function of charge weight and number of exposures.

Date	Pmax, kPa	Config-uration	Animal Number	Charge Weight,g	LW/BW, %	Lungs		Pharynx/ Larynx		Trachea		GI Tract		Solid Abd. Organs		Adj.Sev. Inj. Index	Notes
Pathology Results For Controls																	
1/31/95		Control	506	0	0.78	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
1/31/95		Control	507	0	1.05	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
5/9/95		Control	518	0	0.88	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(ee)
5/9/95		Control	519	0	0.78	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.08	(h)
5/25/95		Control	528	0	0.89	Slight	10	Negative	0	Negative	0	Negative	0	Negative	0	0.16	(i)
5/25/95		Control	529	0	1.11	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
6/20/95		Control	542	0	0.87	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
6/20/95		Control	543	0	0.88	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
7/20/95		Control	554	0	1.01	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
7/20/95		Control	555	0	1.03	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
8/10/95		Control	566	0	0.88	Negative	0	Trace	3	Negative	0	Negative	0	Negative	0	0.03	
8/10/95		Control	567	0	0.91	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
8/31/95		Control	578	0	0.94	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(s)
8/31/95		Control	579	0	0.99	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(s)
9/19/95		Control	588	0	1.02	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
9/19/95		Control	589	0	1.03	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
10/26/95		Control	602	0	1.06	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
10/26/95		Control	603	0	0.98	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
12/21/95		Control	626	0	1.27	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	(b)
12/21/95		Control	627	0	1.22	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
3/5/96		Control	642*	0	1.00	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
3/5/96		Control	643*	0	0.99	Negative	0	Negative	0	Negative	0	Negative	0	Negative	0	0.00	
Mean					0.98		0.5		0.1		0.0		0.0		0.0	0.01	
SD					0.12		2.1		0.6		0.0		0.0		0.0	0.04	
SE					0.03		0.5		0.1		0.0		0.0		0.0	0.01	

* Sheep were being used as 100 shot series test animals but the commanders hatch failed during shot 6 stopping the test series. The sheep were converted to 100 shot controls.

(a) Single plate reflector series.

(b) Scattered light mucosal congestion on either side of fecal pellets. Post mortem change, not blast induced

(c) Trivial single, control level petechia .

(d) Obvious disease pathology in GI tract with multiple areas of mucosal inflammation in the abomasum, small intestine and small colon.

(e) There was agonal hemorrhage on the heart. Abdominal contents were aspirated into bronchi primarily on the left side resulting in an aspiration pneumonitis with concomitant agonal hemorrhage.

(f) Sheep was very agitated during the weighing and harnessing procedure and ran into the pen rails and scales. Lung hemorrhage is probably agonal in origin and not blast related. Animal had been overfed and was bloating at time of sacrifice.

(g) The two scattered areas of mucosal petechiation in the abomasum were consistant with Haemonchus contortus infestation but none were found. Haemonchus ova found in the abdominal contents. Sample taken.

Table B-1. 155mm sph muzzle blast simulation gross pathology results listed as a function of charge weight and number of exposures.

(h) Agonal epicardial petechiation.
(i) Primarily agonal pleural petechiation but there was one spot of parenchymal ecchymosis on the left diaphragmatic lobe. Possible pneumonitis.
(j) Possible pneumonitis, animal regurgitated slight amount of abdominal contents during postexposure hold, trace amounts seen in trachea.
(k) Agonal endocardial and epicardial hemorrhage plus Haemonchus contortus petechiation of abomasal mucosa.
(L) Animal cardiac arrested from iatrogenic factors at approximately five minutes after last blast. Agonal and post mortem changes observed in the heart , lungs, and gastroenteric tract at necropsy.
(m) There were two spots of light ecchymosis along the posterior aspect of both vocal cords (grade 5 lesion). Sheep was hyperactive and noisy. Also rammed neck against top of weighing stall during the process of jumping out of it. Thought not to be a blast lesion.
(n) Sheep started on new feed. There are fewer and much softer fecal pellets in the spiralis and terminalis and no lesions.
(o) Haemonchus contortus petechiation of the abomasal mucosa.
(p) Both diaphragmatic lobes were pneumonic.
(q) Two spots of agonal ecchymosis on the vocal cords. Animal regurgitated abdominal contents and aspirated it into her trachea while being placed on necropsy table which precipitated a violent coughing episode.
(r) Animal had caseous lymphadinitis with concomitant lung involvement.
(s) Mucosal hyperemia of spiralis and/or terminalis related to post mortem change.
(t) Pleuritis/pneumonitis plus small spot of brown rust.
(u) Encapsulated cyst in right apical lobe.
(v) Sheep was not well hydrated the bladder was empty and the fecal material in the large colon and rectum were extremely dry which probably accounts for the mucosal hyperemia of those areas.
(w) Trivial petechiation in the URT.
(x) Four trivial petechia in the URT. Lesion in the trachea might have been mechanically induced during intubation. Two attempts were necessary.
(y) Two trivial petechia in the laryngeal ventricle and slight amount of retractive atelectasis of left diaphragmatic lobe.
(z) One granuloma on left diaphragmatic lobe plus retractive atelectasis and pneumonitis on both lungs.
(aa) Animal aspirated abdominal contents into and beyond bronchi.
(bb) Lesions on vocal cords consisting of two spots of light ecchymosis in addition to the trace petechia. Not blast induced. Animal was very vocal during the hanging procedure prior to ketamine administration.
(cc) Folds of abomasum edematous. There were no hemorrhagic lesions. Not blast related.
(dd) Lower 15cm of rectum hyperemic. Fecal pellets were dry and granular in nature. Caecum and large colon were also hyperemic and fecal material was sticking to mucosa. Haemonchus contortus petechiation in the abomasum but no worms were found.
(ee) Lungs virtually negative. Only three scattered pleural petechia distributed over entire surface of lungs.
(ff) Light pleuritis both diaphragmatic lobes and small parenchymal cyst right diaphragmatic.
(gg) Marginal subclinical pleuritis with adhesions and residual scar tissue on left diaphragmatic lobe.
(hh) One 7.0 x 1.0 cm area of subserosal to serosal hemorhage on cardiac portion of abomasum along mesenteric attachment. This is not a typical blast lesion. A true blast lesion would be submucosal to mucosal. This lesion was just the opposite. Injury score=5 with an ASII=0.10 if counted as a blast lesion.
(ii) Pleuritis noted on both diaphragmatic lobes in addition to an area of subpleural/parenchymal petechiation which appears to be pneumonia. Would be a grade 3 lesion if scored as blast injury.
(jj) A 2.5 x 0.2 cm area of moderate tracheitis. Would be a slight grade 5 lesion if scored as blast injury.
(kk) Small 1.0 x 0.3 cm subcapsular hematoma found on liver. This lesion does not typically occur at these blast levels particularly in the absence of concomitant gastroenteric injuries. Would be a trace grade 4 lesion if scored as a blast injury.

APPENDIX C

PRESSURE-TIME VALUES FOR SHEEP

Table C-1. Test 3 monitor gauge (chief of section) pressure-time values for sheep numbers 508 and 509.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
4/20/95	1	3310	21.9	31.7	274		15.0
	2		20.0	31.4	276	99.9	15.7
	3		22.9	31.1	275	127.9	17.2
	4		23.1	30.7	295	99.9	18.8
	5		20.6			149.4	16.5
	6		24.1	30.6	273	94.9	18.2
Mean			22.1	31.1	279	114.4	16.9
SD			1.6	0.5	9.2	23.5	1.5

Table C-2. Test 4 monitor gauge (chief of section) pressure-time values for sheep numbers 510 and 511.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
4/25/95	1	3310	22.6	30.4	262	100.0	15.5
	2		22.8	31.4	282		17.6
	3		26.6	30.8	272	99.0	17.9
	4		24.6	30.7	304		19.4
	5		25.2	30.7	283		19.2
	6		22.8	31.2	268	99.1	17.1
Mean			24.1	30.9	279	99.4	17.8
SD			1.6	0.4	14.9	0.6	1.4

Table C-3. Test 5 monitor gauge (chief of section) pressure-time values for sheep numbers 512 and 513.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
4/27/95	1	3310	21.5				17.2
	2		22.5	32.3	288	85.8	18.5
	3		25.7	30.3	299	92.8	19.4
	4		21.0	31.6	306	100.0	18.4
	5		25.4	31.1	286		17.3
	6		26.6	29.4	295	93.1	21.2
Mean			23.8	30.9	295	92.9	18.7
SD			2.4	1.1	8.2	5.8	1.5

Table C-4. Test 6 monitor gauge (chief of section) pressure-time values for sheep numbers 514 and 515.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
5/2/95	1	3310	23.6	30.3	285		18.4
	2		22.8	31.9	272	98.8	17.2
	3		25.0	30.9	265		16.3
	4		21.8				16.1
	5		25.0	31.8	277		16.6
	6		22.4	32.3	285		16.8
Mean			23.4	31.4	277	98.8	16.9
SD			1.3	0.8	8.6		0.8

Table C-5. Test 7 monitor gauge (chief of section) pressure-time values for sheep numbers 516 and 517.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
5/4/95	1	3310	27.3	33.4	315		19.4
	2		23.2	31.1	288	97.2	19.9
	3		24.4	31.0	281	99.3	18.4
	4		24.5	29.9	286	99.1	19.2
	5		23.9	29.0	281	99.5	18.1
	6		21.8	31.2	254	93.4	15.1
Mean			24.2	30.9	284	97.7	18.4
SD			1.8	1.5	19.5	2.6	1.7

Table C-6. Test 8 monitor gauge (chief of section) pressure-time values for sheep numbers 520 and 521.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
5/11/95	1	2722	20.3	31.8	247		15.6
	2		18.6	31.0	231	95.8	14.6
	3		23.3	31.5	242	99.8	15.5
	4		23.7	31.2	252		16.8
	5		20.9	31.4	246	91.1	15.8
	6		19.3	31.2	237	96.9	15.3
Mean			21.0	31.4	243	95.9	15.6
SD			2.1	0.3	7.6	3.6	0.7

Table C-7. Test 9 monitor gauge (chief of section) pressure-time values for sheep numbers 522 and 523.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
5/16/95	1	2722	20.5	32.3	272		16.4
	2		22.8	31.8	253	100.0	17.5
	3		23.9	31.1	255	97.4	18.1
	4		19.0	30.1	226	99.9	14.4
	5		21.9	30.6	236	100.0	16.0
	6		18.6	31.1	233		15.3
Mean			21.1	31.2	246	99.3	16.3
SD			2.1	0.8	17.2	1.3	1.4

Table C-8. Test 10 monitor gauge (chief of section) pressure-time values for sheep numbers 524 and 525.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
5/18/95	1	2722	20.0	31.5	234		15.5
	2		22.3	30.7	245	99.3	17.1
	3		20.1	30.5	233	99.6	15.6
	4		21.3	30.5	243	98.0	14.9
	5		18.8	31.2	218	98.3	13.2
	6		21.7	31.1	251		16.4
Mean			20.7	30.9	237	98.8	15.5
SD			1.3	0.4	11.7	0.8	1.3

Table C-9. Test 11 monitor gauge (chief of section) pressure-time values for sheep numbers 526 and 527.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
5/23/95	1	2722	20.7	30.9	236	99.7	15.2
	2		21.5	30.0	236	98.8	16.1
	3		24.0	30.4	249	99.2	18.6
	4		21.1	30.8	238	93.3	16.4
	5		20.2	30.5	232		15.1
	6		22.9	30.3	237		15.5
Mean			21.7	30.5	238	97.8	16.2
SD			1.4	0.3	5.8	3.0	1.3

Table C-10. Test 12 monitor gauge (chief of section) pressure-time values for sheep numbers 530 and 531.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
5/30/95	1	2722	19.6	32.4	238	98.2	15.2
	2		21.0	31.3	231	99.8	15.8
	3		18.6	31.7	233	99.2	14.5
	4		22.9	31.0	254	99.8	18.6
	5		19.3	31.1	232	99.6	15.0
	6		20.8	31.5	234		15.4
Mean			20.4	31.5	237	99.3	15.8
SD			1.5	0.5	8.7	0.7	1.5

Table C-11. Test 13 monitor gauge (chief of section) pressure-time values for sheep numbers 532 and 533.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
6/1/95	1	2268	15.9	30.9	184	94.2	12.0
	2		20.0	27.0	206	98.6	14.7
	3		15.4	31.3	202	75.9	13.0
	4		16.2	30.2	204		13.1
	5		18.5	30.5	213		14.2
	6		18.1	30.6	201	91.0	14.6
Mean			17.4	30.1	202	89.9	13.6
SD			1.8	1.6	9.6	9.9	1.1

Table C-12. Test 14 monitor gauge (chief of section) pressure-time values for sheep numbers 534 and 535.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
6/6/95	1	2268	17.5	31.5	205		13.5
	2		18.4	31.0	213	82.6	14.8
	3		18.0	29.5	215		13.9
	4		15.9	35.1	189	97.0	12.1
	5		18.1	30.7	210		14.4
	6		18.4	30.5	208	100.0	13.6
Mean			17.7	31.4	207	93.2	13.7
SD			0.9	1.9	9.4	9.3	0.9

Table C-13. Test 15 monitor gauge (chief of section) pressure-time values for sheep numbers 536 and 537.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
6/8/95	1	2268	17.8	31.5	210		13.8
	2		17.5	31.4	210	88.8	13.6
	3		18.4	31.2	215		14.9
	4		17.8	32.2	213	99.4	13.8
	5		17.9	31.2	203	82.1	13.4
	6		17.9	30.3	199		13.6
Mean			17.9	31.3	208	90.1	13.9
SD			0.3	0.6	6.1	8.7	0.5

Table C-14. Test 16 monitor gauge (chief of section) pressure-time values for sheep numbers 538 and 539.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
6/13/95	1	2268	19.8	31.1	222		15.0
	2		16.6	31.2	179		11.8
	3		17.8	31.0	216	95.0	14.3
	4		18.7	30.8	215	98.2	14.6
	5		16.8	30.3	204	93.2	13.2
	6		18.0	30.2	203		14.0
Mean			18.0	30.8	207	95.5	13.8
SD			1.2	0.4	15.3	2.5	1.2

Table C-15. Test 17 monitor gauge (chief of section) pressure-time values for sheep numbers 540 and 541.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
6/15/95	1	2268	18.6	31.1	208	97.4	15.0
	2		16.8	30.2	191		13.3
	3		17.1	34.7	132		13.1
	4		18.9	32.1	216		14.9
	5		17.5	30.2	197	98.3	12.8
	6		15.5	33.8	162	100.0	12.2
Mean			17.4	32.0	184	98.6	13.6
SD			1.2	1.9	31.6	1.3	1.1

Table C-16. Test 18 monitor gauge (chief of section) pressure-time values for sheep numbers 544 and 545.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
6/22/95	1	2268	19.8	30.6	211	99.6	14.4
	2		18.5	31.5	203	98.2	12.8
	3		17.5	30.5	193	89.6	13.2
	4		19.7	30.3	224	95.5	16.7
	5		17.6	30.6	206	99.8	13.1
	6		17.3	30.7	201		13.4
	7		16.5	30.3	197	88.5*	13.5
	8		20.9	30.4	216	99.7	15.2
	9		17.7	30.6	203	92.1	13.2
	10		17.4	31.1	209	96.8	13.5
	11		16.5	30.5	196	93.7	13.3
	12		18.3	30.5	198	96.0	12.8
	13		16.1	32.2	215	91.8	13.2
	14		19.5	30.4	204	95.9	14.8
	15		17.7	30.1	199	91.9	14.7
	16		17.8	31.1	204	92.4	13.9
	17		17.5	30.4	213	98.5	14.5
	18		17.8	31.2	208		13.5
	19		19.8	31.8	215	99.9	15.3
	20		16.8	30.8	204		13.6
	21		18.4	27.1	208	99.3	14.5
	22		17.3	31.8	216	97.9	14.3
	23		20.8	31.4	230		16.5
	24		19.1	31.8	220	91.8	14.1
	25		17.8	31.6	214	92.8	14.5
Mean			18.2	30.8	208	95.3	14.1
SD			1.3	1.0	9.1	3.6	1.0

Table C-17. Test 19 monitor gauge (chief of section) pressure-time values for sheep numbers 546 and 547.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
6/27/95	1	2268	17.2	31.2	209		13.7
	2		18.5	30.3	186	91.1	12.6
	3		18.0	30.4	195	99.4	12.5
	4		18.4	31.5	209	99.9	14.0
	5		20.6	30.4	207	96.5	15.7
	6		18.1	30.3	211	98.9	14.2
	7		19.3	30.5	211	88.5*	14.6
	8		19.6	30.9	208	90.9	15.1
	9		19.0	30.4	218	98.5	15.6
	10		17.9	32.0	213	91.8	14.2
	11		20.6	30.7	211	99.1	16.6
	12		17.2	30.9	195	96.4	12.8
	13		17.0	30.7	203	96.5	13.2
	14						
	15		18.8	31.0	201	99.1	12.7
	16		19.6	30.1	216	97.1	15.5
	17		18.6	31.3	208	99.4	14.3
	18		16.9	30.7	192	96.7	12.4
	19		17.7	29.9	205	94.2	13.4
	20		17.5	30.7	202	97.3	13.5
	21		18.3	30.9	207	96.1	14.3
	22		17.4	31.4	205		14.6
	23		18.0	31.1	215		13.3
	24		19.6	31.2	213	96.9	13.7
	25		18.7	31.3	216	92.7	14.5
Mean			18.4	30.8	207	96.0	14.0
SD			1.1	0.5	8.1	3.3	1.1

Table C-18. Test 20 monitor gauge (chief of section) pressure-time values for sheep numbers 548 and 549.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
6/29/95	1	2268	19.0	32.5	228		14.5
	2		18.6	29.9	207	96.2	14.1
	3		17.4	31.4	213		13.9
	4		17.7	30.7	205		13.4
	5		19.7	31.9	215	99.9	14.9
	6		19.2	32.0	212	99.9	13.3
	7		16.9	32.0	217		14.4
	8		17.4	31.3	209	96.7,	13.8
	9		15.4	32.0	197	100.0	12.4
	10		19.5	32.6	210	87.4	13.7
	11		17.7	31.8	200	99.3	13.2
	12		20.3	32.0	206	94.0	14.1
	13		19.8	30.8	218		16.1
	14						
	15		19.6	30.1	208	93.9	14.5
	16		20.2	32.3	226		15.6
	17		17.7	31.0	199	99.8	13.0
	18		19.8	31.9	222		15.9
	19		21.3	30.5	212		15.8
	20		17.6	26.2	171	92.2	12.8
	21		20.6	30.5	206		14.1
	22		19.4	30.2	211	99.7	14.5
	23		17.2	21.1	134	95.7	12.6
	24		20.6	31.7	218		16.1
	25						
Mean			18.8	30.7	206	96.5	14.2
SD			1.5	2.5	19.5	3.9	1.1

Table C-19. Test 21 monitor gauge (chief of section) pressure-time values for sheep numbers 550 and 551.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
7/6/95	1	2268	16.9	30.6	197		13.4
	2		16.8	30.8	202	98.2	12.8
	3		15.7	30.1	203	92.9	12.8
	4		15.9	30.7	199	93.4	12.9
	5		20.4	30.8	217		15.7
	6		19.8	31.1	210	96.6	15.8
	7		16.5	30.3	193	99.5	12.9
	8		17.4	30.4	208		13.7
	9		17.6	31.1	208	100.0	14.0
	10		15.8	31.0	190	97.7	12.1
	11		16.4	31.1	205	91.7	13.9
	12		17.8	30.9	198	99.1	13.0
	13		21.0	30.4	216		16.5
	14		20.2	30.4	219	100.0	16.4
	15		17.4	30.4	206	89.1	13.4
	16		19.2	30.3	216		15.4
	17		17.3	31.0	209		13.7
	18		18.0	29.9	208		14.0
	19		18.0	30.9	203	99.9	13.7
	20		16.4	30.7	198		12.9
	21		20.4	29.9	211		14.7
	22		18.7	31.9	218		15.5
	23		21.4	30.3	218	90.4	16.3
	24		17.7	30.8	207		13.4
	25		18.6	31.2	220		13.9
Mean			18.1	30.7	207	96.0	14.1
SD			1.7	0.5	8.5	4.0	1.3

Table C-20. Test 22 monitor gauge (chief of section) pressure-time values for sheep numbers 552 and 553.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
7/18/95	1	2268	16.8	31.2	206	100.0	12.6
	2		18.3	30.2	221	98.1	13.9
	3		17.3	30.8	204	98.1	13.0
	4		18.2	27.2	206	99.5	13.5
	5		18.1	31.1	200	93.2	14.6
	6		17.3	30.5	203	99.8	13.1
	7		16.1	30.5	199	96.2	14.1
	8		16.9	30.7	205	92.2	12.5
	9		17.4	30.5	197	91.5	13.6
	10		17.1	31.0	204	96.1	12.4
	11		18.7	30.9	208	99.9	13.7
	12		19.6	30.4	213	99.4	14.1
	13		17.0	31.2	207	98.9	15.2
	14		19.8	30.6	207	93.3	13.8
	15		19.8	30.4	203	99.6	14.4
	16		19.1	30.8	204	96.8	13.8
	17		17.9				14.2
	18		17.3	31.2	214	92.4	13.2
	19		19.9	30.3	215		14.2
	20		17.7	30.6	203	96.3	15.2
	21		21.3	30.4	207	92.7	13.5
	22		17.9	31.3	206	98.7	14.1
	23		18.5	30.8	209	96.8	12.5
	24		17.7	27.3	204	96.5	14.2
	25		17.5	31.2	210	98.6	13.8
Mean			18.1	30.5	206	96.7	13.0
SD			1.2	1.0	5.3	2.8	0.8

Table C-21. Test 23 monitor gauge (chief of section) pressure-time values for sheep numbers 556 and 557.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
7/25/95	1	1814	14.4	31.4	178		11.4
	2		16.2	30.7	175	93.1	13.6
	3		14.4	31.3	160		10.6
	4		13.2	31.6	170	93.0	11.0
	5		14.4	31.2	168	92.5	11.2
	6		15.0	30.2	161	98.2	11.4
	7		14.9	26.6	140	93.2	11.9
	8		14.8	31.4	155	95.4	11.2
	9		15.6	31.2	183	98.5	12.8
	10		16.0	31.2	178	93.1	11.5
	11		14.8	31.0	172	100.0	11.8
	12		14.2	31.1	174	96.9	11.4
	13		14.4	30.8	183	99.1	12.3
	14		14.1	30.3	166		11.3
	15		16.9	30.2	175	100.0	12.3
	16		15.8	31.1	176	91.8	12.1
	17		15.7	31.1	174	99.1	11.7
	18		15.4	31.1	174	99.3	11.4
	19		16.9	30.8	161	93.7	11.7
	20		14.4	31.0	174	96.2	11.4
	21		14.6	21.0	117	96.0	10.8
	22		13.8	30.3	175	96.4	11.1
	23		14.2	31.0	167	96.1	11.3
	24		14.1	31.2	174	96.3	11.2
	25		14.4	31.2	155	96.7	10.5
Mean			14.9	30.4	167	96.1	11.6
SD			0.9	2.2	14.3	2.6	0.7

Table C-22. Test 24 monitor gauge (chief of section) pressure-time values for sheep numbers 558 and 559.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
7/27/95	1	1814	14.9	31.5	182	99.6	11.8
	2		14.4	31.6	164	92.7	11.8
	3		13.8	30.6	172	99.0	11.1
	4		13.7	31.5	160	93.8	10.9
	5		13.4	31.3	165	96.6	11.1
	6		15.5	31.2	181	98.6	13.3
	7			Early Trigger			
	8		14.2	30.2	171	99.0	11.2
	9		15.5	30.4	176	99.6	12.4
	10		14.5	31.3	168	98.8	11.5
	11		15.0	30.6	174	98.4	12.9
	12		15.9	30.7	175	93.2	12.7
	13		15.3	30.9	171	98.1	12.0
	14		14.5	31.4	171	95.5	11.1
	15		17.7	31.5	196	96.4	15.2
	16		15.1	30.9	172	98.6	11.1
	17		14.0	31.3	161	99.6	11.1
	18		14.8	30.4	175	98.4	12.4
	19		14.2	30.2	172	96.3	12.1
	20		14.1	31.3	165	98.6	10.9
	21		14.8	31.3	163	96.5	11.6
	22		14.6	31.2	157	96.4	10.8
	23		15.4	30.6	178	99.6	12.1
	24		14.6	30.7	167	91.6	11.9
	25		13.0	30.4	164	95.8	10.8
Mean			14.7	31.0	171	97.1	11.8
SD			1.0	0.5	8.4	2.4	1.0

Table C-23. Test 25 monitor gauge (chief of section) pressure-time values for sheep numbers 560 and 561.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
8/1/95	1	1814	17.3	31.8	183	97.8	14.5
	2		15.6	27.9	176	100.0	13.4
	3		16.1	31.3	181	99.5	12.1
	4		18.1	31.0	180	99.3	14.9
	5		14.3	31.1	167	99.6	11.6
	6		13.8	23.7	126	99.7	10.8
	7		13.6	30.6	164	99.6	11.5
	8		14.0	30.7	169	97.0	10.9
	9		14.6	31.6	164	98.8	12.4
	10		16.4	31.1	171	97.1	12.6
	11		14.8	31.5	175	96.8	12.4
	12		15.5	31.0	180	98.1	13.8
	13		14.0	31.6	172	92.3	11.8
	14		16.3	31.6	182		13.7
	15		13.2	32.0	147	94.7	10.6
	16		13.7	31.5	164	97.5	10.9
	17		12.5	31.1	157	96.9	10.7
	18		15.2	31.3	179	96.1	11.5
	19		16.6	31.0	166	90.6	11.0
	20		14.3	31.4	169		11.2
	21						
	22		20.5			99.9	11.8
	23		12.9	30.3	157	97.3	10.3
	24		13.4	31.6	174	99.0	11.4
	25		15.8	26.4	137	97.8	10.9
Mean			15.1	30.6	167	97.5	11.9
SD			1.8	2.0	14.5	2.4	1.3

Table C-24. Test 26 monitor gauge (chief of section) pressure-time values for sheep numbers 562 and 563.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
8/3/95	1	1814	15.3	31.2	167	98.5	12.3
	2		14.4	31.6	164	95.6	11.4
	3		14.1	31.5	172	96.2	11.8
	4		14.3	31.2	174	98.3	12.2
	5		14.6	31.3	163	97.5	10.7
	6		14.0	31.4	162	93.2	11.3
	7		15.4	30.5	169	98.1	12.1
	8		14.0	31.5	172	98.2	11.8
	9		14.3	30.5	166	96.6	11.5
	10		18.2	31.0	177	100.0	13.4
	11		14.4	30.8	166	92.2	11.6
	12		14.0	31.2	160	91.7	10.3
	13		14.2	31.4	164	93.1	10.5
	14		15.1	30.9	175	99.9	12.4
	15		14.2	31.4	161	93.1	11.0
	16		14.2	31.3	177	96.2	12.0
	17		14.2	30.4	164	99.3	10.7
	18		15.5	31.4	172	96.2	12.9
	19		13.8	31.7	161	93.5	11.6
	20		17.0	29.8	185	92.6	14.0
	21		14.9	30.9	165	98.8	11.2
	22		16.8	30.3	182	88.8	13.2
	23		15.4	31.4	170	96.1	11.9
	24		15.5	30.7	180	96.1	12.4
	25		14.8	30.3	176	96.0	11.7
Mean			14.9	31.0	169.8	95.8	11.8
SD			1.1	0.5	7.1	2.9	0.9

Table C-25. Test 27 monitor gauge (chief of section) pressure-time values for sheep numbers 564 and 565.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
8/8/95	1	1814	14.0	31.6	160	98.6	10.8
	2		16.2	31.0	181	96.8	13.5
	3		14.3	31.1	162	93.4	11.3
	4		13.5	21.2	118	90.2	10.8
	5		14.0	31.5	168	100.0	11.1
	6		16.8	30.4	178	97.5	14.3
	7		14.3	31.9	159	92.3	11.8
	8		15.6	31.3	179	95.2	12.1
	9		17.4	31.1	183	99.2	13.7
	10		14.2	31.2	168	96.6	11.8
	11		14.8	30.6	182	95.8	12.3
	12		15.2	30.7	163	96.4	12.2
	13		16.8	30.4	192	96.2	13.8
	14		14.4	30.4	169	96.3	10.6
	15		14.9	30.6	178	99.6	11.4
	16		15.8	31.7	169	96.4	11.0
	17		14.9	30.8	172	97.1	11.4
	18		18.4				13.1
	19		14.9	30.4	168	93.0	11.6
	20		12.1	31.2	156	92.5	10.1
	21		14.8	26.4	145	96.4	11.3
	22		14.7	30.5	162	99.7	10.9
	23		15.2	30.4	170	96.1	11.1
	24		19.4	30.3	182	95.8	14.0
	25		14.9			98.5	11.9
Mean			15.3	30.3	168.0	96.2	11.9
SD			1.6	2.2	15.3	2.5	1.2

Table C-26. Test 28 monitor gauge (chief of section) pressure-time values for sheep numbers 568 and 569.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
8/15/95	1	2268	17.9	30.5	211		14.6
	2		17.5	27.6	206	99.6	14.7
	3		18.9	30.3	213	97.9	13.7
	4		16.3	30.7	205		13.3
	5		17.2	30.4	203	99.4	13.6
	6		16.9	30.8	209	96.7	13.8
Mean			17.5	30.1	207.8	98.4	14.0
SD			0.9	1.2	3.8	1.4	0.6

Table C-27. Test 29 monitor gauge (chief of section) pressure-time values for sheep numbers 570 and 571.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
8/17/95	1	1814	16.3	31.2	176	99.8	12.5
	2		15.9	31.6	176	97.7	12.8
	3		14.8	31.6	181		12.6
	4		14.4	31.3	163	94.7	11.6
	5		15.2	31.2	179	99.7	11.8
	6		14.7	31.2	180	99.7	12.2
	7		14.0	30.8	167	97.9	11.1
	8		14.1	30.3	171	99.2	11.5
	9		14.0	31.6	159	99.5	11.1
	10		16.3	30.4	171	97.1	12.4
	11		12.6	31.4	173	98.6	10.7
	12		15.0	31.4	177	96.8	12.2
	13		14.0	31.6	166	97.3	10.9
	14		13.7	32.4	166	97.8	11.3
	15		15.4	31.7	174	97.1	12.1
	16		16.6	31.6	175	99.9	11.1
	17		16.0	30.8	180	97.2	13.0
	18		15.2	31.5	174	97.3	12.0
	19		17.6	31.5	179	96.5	12.5
	20		12.2	31.6	176	98.8	13.4
	21		15.0	31.5	159	93.7	10.9
	22		15.7	31.6	178	98.7	13.0
	23		14.4	31.5	179	97.2	12.1
	24		14.8	30.5	171	99.3	11.1
	25		19.2	31.2	181	93.5	14.7
	26		15.5	31.5	169	97.2	11.2
	27		14.2	31.2	163	99.3	11.0
	28		15.0	31.1	164	99.9	11.0
	29		12.6			100.0	10.4
	30		14.2	26.6	140	97.1	10.8
	31		14.7	26.6	145	99.7	11.4
	32		13.5	31.5	167	99.8	10.3
	33		14.5	22.4	117	98.6	10.9
	34		14.2	30.5	163	99.1	10.5
	35		14.5	30.2	160	99.9	10.8
	36		15.7	31.4	169	92.8	11.4
	37		13.4	31.1	164	97.3	10.7
	38		15.5	29.1	153	96.7	11.3
	39		14.7	31.1	165	98.4	11.8
	40		13.5	31.1	155	97.6	11.0
	41		14.0	31.6	173	99.9	11.3
	42		14.1	31.2	166	93.3	11.6
	43		13.7	31.5	160	92.2	10.3
	44		15.5	30.3	165	99.5	11.5

Table C-27. Test 29 monitor gauge (chief of section) pressure-time values for sheep numbers 570 and 571.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		15.6	30.6	155	97.6	10.8
	46		13.6	31.2	168	97.1	11.1
	47		16.0	30.5	171	83.6	12.4
	48		13.5	31.2	170	98.6	11.3
	49		14.6	30.9	174	99.5	11.4
	50		13.8	30.5	163	97.0	10.6
	51		14.7	31.2	179	100.0	11.5
	52		14.8	30.2	168	79.1	11.5
	53		15.2	31.1	169	99.4	10.9
	54		15.4	30.2	168	99.6	12.0
	55		17.4	30.4	185	91.5	14.1
	56		14.9	31.2	167	88.7	11.2
	57		14.7	30.6	179	92.6	11.6
	58		15.6	31.3	169	99.9	10.9
	59		16.2	30.6	177	96.7	12.5
	60		14.4	31.5	162	91.5	10.3
	61		15.9	30.8	173	96.4	11.9
	62		13.6	21.4	117	95.8	10.5
	63		15.5	30.9	171	89.2	11.9
	64		15.4	31.0	174	97.9	11.3
	65		19.8	30.2	179	98.0	14.5
	66		15.4	30.3	187	86.6	12.9
	67		15.9	30.9	175	96.2	11.8
	68		15.6	31.4	177	99.4	12.4
	69		13.4	30.9	170	97.3	11.8
	70		16.2	30.6	167	96.4	11.2
	71		14.8	30.4	167	97.1	10.8
	72		13.7	31.0	159	98.2	10.5
	73		13.8	21.2	115	98.6	10.6
	74		15.9	30.3	176	92.8	12.3
	75		14.4	30.4	177	99.8	11.5
	76		14.9	30.5	165	96.6	10.6
	77		15.3	30.4	168	91.7	11.8
	78		16.1	30.3	167	91.8	12.6
	79		14.7	31.8	170	99.2	11.6
	80		14.2	30.4	164	95.6	10.9
	81		15.8	31.1	177	96.6	12.9
	82		15.0	30.4	165	100.0	11.9
	83						10.7
	84		15.1	31.0	164	99.9	11.1
	85		14.3	31.6	161	96.2	10.4
	86					99.4	10.6
	87		14.1			96.8	10.7
	88		13.6	21.3	117	99.9	11.1

Table C-27. Test 29 monitor gauge (chief of section) pressure-time values for sheep numbers 570 and 571.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89						10.4
	90		20.3			100.0	12.6
	91		19.5			100.0	10.6
	92					98.2	11.3
	93					99.8	10.9
	94					99.6	10.4
	95		15.3	30.3	166	75.9	10.6
	96		14.6	26.6	136		10.6
	97		14.3				10.7
	98		14.2	30.7	163	100.0	10.9
	99		15.2	30.0	171	98.9	10.8
	100		22.4				10.8
Mean			15.1	30.4	166.5	96.7	11.5
SD			1.6	2.2	14.0	4.3	0.9

Table C-28. Test 30 monitor gauge (chief of section) pressure-time values for sheep numbers 572 and 573.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
8/22/95	1	2268	19.2	27.4	209	99.8	14.7
	2		19.2	30.6	209	97.2	16.0
	3		15.8	31.1	185	99.9	11.7
	4		16.8	31.8	217	99.7	13.8
	5		17.5	30.4	208	99.7	13.5
	6		16.4	31.2	202	96.0	13.9
Mean			17.5	30.4	205.0	98.7	13.9
SD			1.4	1.6	10.9	1.7	1.4

Table C-29. Test 31 monitor gauge (chief of section) pressure-time values for sheep numbers 574 and 575.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
8/24/95	1	1814	13.8	30.9	166		11.4
	2		13.8	31.5	173		11.4
	3		16.6				12.4
	4		15.4	31.4	168		11.4
	5		17.0	31.6	187	99.4	12.8
	6					99.9	12.1
	7					99.6	12.0
	8		15.9	31.0	190	99.6	12.3
	9		14.2	31.6	175		12.0
	10		16.6	30.8	171	99.9	12.6
	11		13.8	30.9	179	100.0	12.1
	12		15.7	31.4	170	99.9	12.4
	13		14.8	30.9	169	98.3	11.6
	14		14.5	30.9	176		12.2
	15		12.9	32.3	165	100.0	10.7
	16		15.0	31.3	158	98.4	10.6
	17		15.4	30.8	174	100.0	12.6
	18		17.3	30.2	179		13.8
	19		14.9	31.2	170	99.8	11.8
	20		15.5	31.3	174		13.2
	21		13.4	31.1	170	100.0	11.1
	22		15.7	32.3	170	99.5	10.9
	23		14.4	31.3	171	99.8	11.4
	24		13.4	31.6	171	98.0	11.2
	25		17.3	31.2	182		13.3
	26		14.0	31.1	166	99.5	11.0
	27		14.4	30.7	175	99.9	12.1
	28		14.9	30.6	164	99.9	10.8
	29		15.1	31.0	184	99.5	12.8
	30		14.2	30.7	169	100.0	11.6
	31		14.0	30.2	173	100.0	11.8
	32		16.1			100.0	13.2
	33		14.8	31.0	183	100.0	12.2
	34		12.8				10.6
	35		14.6	30.0	176		11.8
	36		16.0	31.3	180		13.0
	37		16.3	30.8	178	99.9	12.1
	38		14.2	31.9	179		11.7
	39		16.9	30.8	181	99.9	13.2
	40		15.3	30.6	179		11.8
	41		13.5	30.6	166	99.9	10.6
	42		14.9	30.4	164	99.8	10.9
	43		14.6	31.3	169		11.2
	44		16.4	30.9	185	99.9	13.6

Table C-29. Test 31 monitor gauge (chief of section) pressure-time values for sheep numbers 574 and 575.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		14.0	30.6	166	100.0	11.0
	46		14.9	30.2	172	99.6	11.0
	47		14.2	31.5	169	99.7	11.0
	48		17.5	30.2	180	100.0	13.2
	49		15.2	30.5	177	96.8	11.8
	50		16.0	30.7	175		11.4
	51		14.5	26.6	139	100.0	11.0
	52		13.8	30.6	162	92.3	10.8
	53		14.8	31.4	171	99.8	12.3
	54		13.8	31.1	164	97.9	11.3
	55		13.8	26.4	139	99.5	10.6
	56					99.7	10.0
	57		13.7	31.0	164	100.0	11.0
	58		15.5	26.5	147	99.7	11.4
	59		18.2	30.5	169	99.4	11.8
	60		14.3	31.0	161	91.7	12.2
	61		15.4	30.6	173	100.0	12.7
	62		13.4	26.4	139	99.6	10.9
	63		15.2	26.2	141	96.6	10.6
	64		15.1	30.9	179		12.0
	65		16.6	30.8	175	100.0	12.7
	66						
	67		13.3	26.4	140		10.8
	68		17.2	30.6	189		14.7
	69		13.7	31.0	167	99.0	11.3
	70		16.3	30.8	173		13.2
	71		14.1	30.4	163	100.0	10.8
	72		13.1	26.4	142	99.6	10.6
	73		15.0	30.6	176	99.9	12.8
	74		14.0	30.3	174		11.3
	75		14.3	21.2	120	99.8	11.2
	76		14.5	31.9	173		11.4
	77		16.9	31.2	176	99.0	12.0
	78		14.5	30.2	170		11.3
	79		19.6	30.6	181	99.6	15.0
	80		15.2	30.3	170	99.6	11.9
	81		16.2	30.5	180	100.0	12.7
	82		16.1	31.0	164	99.8	11.5
	83		15.2	30.1	179		12.2
	84		12.7	31.4	156	99.9	10.4
	85		14.3	30.6	168	99.9	10.6
	86		15.6	30.9	174	99.7	12.6
	87		15.4	30.3	179	100.0	12.6
	88		14.4	26.4	137	96.5	10.7

Table C-29. Test 31 monitor gauge (chief of section) pressure-time values for sheep numbers 574 and 575.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		14.8	30.5	179		12.4
	90		15.0	30.4	177		12.4
	91		15.2	30.6	173	98.6	11.8
	92		13.8	30.5	170	100.0	10.9
	93		17.0	30.3	175	100.0	12.4
	94		16.6	30.4	172		12.1
	95		15.0	30.4	172	99.9	12.7
	96						
	97		16.4				12.2
	98		15.0				11.6
	99		13.8	30.4	166	98.4	11.2
	100		13.8	31.2	163	100.0	10.8
Mean			15.0	30.4	169.3	99.3	11.8
SD			1.3	1.7	12.5	1.5	0.9

Table C-30. Test 32 monitor gauge (chief of section) pressure-time values for sheep numbers 576 and 577.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
8/29/95	1	2268	15.8	30.5	178		11.6
	2		13.6	29.7	170	100.0	10.9
	3		17.2	30.2	187		13.5
	4		15.3	31.3	172	100.0	11.7
	5		15.4	31.1	177		11.9
	6		14.5				11.5
Mean			15.3	30.6	176.8	100.0	11.9
SD			1.2	0.7	6.6	0.0	0.9

Table C-31. Test 33 monitor gauge (chief of section) pressure-time values for sheep numbers 580 and 581.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
9/5/95	1	2268	19.9	30.9	219	99.6	15.2
	2						14.1
	3						15.1
	4		17.0			100.0	13.6
	5		17.0	30.6	212	100.0	14.1
	6		15.4	30.1	192	93.1	11.4
Mean			17.3	30.5	207.7	98.2	13.9
SD			1.9	0.4	14.0	3.4	1.4

Table C-32. Test 34 monitor gauge (chief of section) pressure-time values for sheep numbers 582 and 583.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
9/7/95	1	1814	16.0	31.2	188	99.7	13.0
	2		16.2	31.3	180	98.6	12.9
	3		14.2	31.2	179	96.2	11.7
	4		15.0	31.0	184	97.5	13.1
	5		15.4	32.1	179	87.0	12.3
	6		15.3	30.9	177		13.2
	7		14.6	30.5	165	88.5	11.0
	8		15.0	32.3	171	98.6	11.5
	9		13.9	31.8	167	92.0	11.2
	10		15.1	31.7	169	99.1	11.8
	11		16.4	30.4	182	97.9	13.7
	12		15.9	30.6	186	93.4	13.4
	13		15.6	32.6	174	98.1	11.2
	14		14.7	31.0	182	99.6	12.3
	15		14.0	21.0	120	99.9	11.2
	16		14.4	31.5	169	99.9	11.6
	17		14.3	31.1	172	100.0	13.8
	18		14.8	30.2	162	91.8	11.3
	19		13.8	30.7	170	99.7	10.8
	20		14.5	30.7	168	97.8	11.6
	21		17.0	30.7	189	97.0	14.7
	22		13.6	30.6	165		11.6
	23		19.3	30.5	193	97.8	16.1
	24		16.7	30.2	177	97.9	12.6
	25		15.4	31.0	178	99.9	11.8
	26		15.2	30.5	177		12.0
	27		13.7	30.5	169	98.4	11.7
	28		14.0	31.0	174	99.4	11.5
	29		15.2	31.2	175	88.8	12.4
	30		15.4	30.2	175	99.5	12.9
	31		14.7	31.9	172	93.1	11.9
	32		13.6	31.7	175	99.6	11.5
	33		15.6	31.4	181	98.4	13.0
	34		14.3	31.2	170	99.6	11.5
	35		16.6	31.4	169	91.2	12.3
	36		13.5	31.2	166	100.0	10.8
	37		13.5	31.6	156	99.8	10.3
	38		14.7	31.1	165	97.5	11.1
	39		14.6	21.5	111	88.7	11.4
	40						
	41		13.8			99.8	11.1
	42		15.1	31.7	184	99.4	12.9
	43		14.2	31.3	167	87.4	11.2
	44		14.0	25.8	141	86.3	10.6

Table C-32. Test 34 monitor gauge (chief of section) pressure-time values for sheep numbers 582 and 583.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		16.6	30.1	179		13.0
	46		14.1	31.6	166	99.8	10.6
	47						12.7
	48		14.3	31.6	172	97.3	11.4
	49		15.1	31.7	168	99.8	11.0
	50		13.7	31.6	167	92.9	11.4
	51		14.7	31.3	176	99.9	11.6
	52		15.3	32.0	171	92.9	11.6
	53		14.8	30.8	174	99.9	11.6
	54		14.3	31.7	168	99.8	11.3
	55		12.8	31.9	165	97.5	11.1
	56		13.8	31.9	162	98.7	10.9
	57		13.8	31.5	169	100.0	10.5
	58		16.0	30.4	178	99.8	12.3
	59		14.3	30.4	167	95.7	11.0
	60		14.9	30.4	177	97.9	11.6
	61		13.9	31.3	168	95.7	11.6
	62		14.6	30.4	175	99.6	12.0
	63		14.0	31.6	170	99.8	11.3
	64		14.3	31.6	168	98.6	11.3
	65		14.6	31.0	181		11.6
	66		13.2	26.4	134	91.3	10.9
	67		13.6	31.6	174	99.8	11.4
	68		16.8	30.6	175	99.3	13.3
	69		14.4	31.2	165	100.0	10.4
	70		15.7	31.0	182		12.3
	71		14.2	31.9	174	99.7	10.9
	72		13.9	31.1	173	98.8	11.6
	73		15.0	30.4	174	99.9	11.8
	74		14.2	31.1	173	97.7	11.2
	75		14.3	31.3	176	99.1	11.6
	76		13.4	30.8	169	100.0	11.0
	77		14.9	30.7	178	99.6	12.9
	78		14.2			100.0	11.1
	79		13.5	23.7	131	99.2	10.9
	80		16.2	31.1	174	92.3	13.4
	81		14.5	30.9	176	99.2	12.6
	82		14.7	31.2	163	99.8	11.3
	83		18.4	31.2	189	97.6	14.2
	84		14.6	31.5	176	98.7	12.3
	85		14.4	26.4	136	99.4	10.3
	86		14.6	31.4	171	99.6	11.6
	87		14.0	30.3	177	97.6	11.8
	88		15.2	31.4	165	99.8	11.6

Table C-32. Test 34 monitor gauge (chief of section) pressure-time values for sheep numbers 582 and 583.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		15.7	30.2	182	100.0	12.8
	90		15.3	31.5	181	99.1	12.7
	91		17.9	31.1	168	100.0	11.6
	92		14.8	30.5	175		12.0
	93		14.6	30.2	176	99.2	11.8
	94		13.6	31.4	168	99.8	10.9
	95		13.9	24.5	122	98.7	10.2
	96		13.4	24.8	128	99.9	10.3
	97		13.9	21.9	117	97.6	11.5
	98		15.2	31.0	181	97.8	12.0
	99		13.7	31.6	159	99.7	10.5
	101		14.9	21.0	121	100.0	11.6
Mean			14.8	30.4	168.5	97.6	11.8
SD			1.1	2.4	16.3	3.5	1.0

Table C-33. Test 35 monitor gauge (chief of section) pressure-time values for sheep numbers 584 and 585.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
9/12/95	1	2268	19.5	31.3	220	99.5	15.6
	2		17.7	31.3	220	99.7	14.9
	3		17.4	26.9	202		14.0
	4		17.7	30.6	197	100.0	12.8
	5		15.4	31.4	197	86.8	12.0
	6		17.3	30.6	214	99.6	14.5
Mean			17.5	30.4	208.3	97.1	14.0
SD			1.3	1.7	11.0	5.8	1.3

Table C-34. Test 36 monitor gauge (chief of section) pressure-time values for sheep numbers 586 and 587.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
9/14/95	1	1814	15.0	31.5	174		11.5
	2		15.8	31.2	182		13.6
	3		15.0	31.5	180	100.0	11.9
	4		13.1	31.6	171	95.9	11.0
	5		14.6	30.7	179	98.5	11.6
	6		15.3	31.2	172	99.6	12.1
	7		15.9	29.5	161	98.4	11.8
	8		14.9	30.5	181		12.4
	9		13.6	30.5	160	98.9	10.7
	10		13.3	29.2	158	96.7	11.0
	11		16.7	31.3	174	99.2	11.5
	12		15.0	30.6	162	98.6	11.9
	13		15.4	31.2	176	97.5	12.6
	14		13.7	30.5	173	99.6	10.8
	15		14.2	24.6	136		10.8
	16		14.4	31.1	177	99.2	11.7
	17		14.2	30.1	162	98.5	11.4
	18		14.9	31.3	176	97.5	12.0
	19		14.5	30.6	171	88.6	11.8
	20		13.9	31.6	173		11.5
	21		15.5	30.5	175	98.6	12.9
	22		15.5	30.1	184	99.8	12.9
	23		14.5	31.6	165	99.1	11.2
	24		13.8	31.3	163	98.2	11.1
	25		14.4	30.5	176	99.6	12.0
	26		14.3	30.5	174	99.8	11.0
	27		14.3	30.8	177	99.7	11.4
	28		17.6	30.6	173	96.0	12.8
	29		14.1	29.9	165	98.0	11.7
	30		18.8	30.9	184	99.4	13.9
	31		13.9	30.6	164	93.3	10.7
	32		15.6	31.7	158	92.3	10.3
	33		13.4	30.6	162	99.0	10.5
	34		14.3	31.3	176	91.4	11.5
	35		14.3	30.5	173	93.5	11.7
	36		15.3	31.0	185	100.0	12.8
	37		13.6	31.6	162	92.0	10.7
	38		15.3	28.9	166	91.4	11.3
	39		15.9	30.4	179	99.6	12.8
	40		14.0	30.1	172	97.7	11.6
	41		13.2	31.6	167	99.9	10.5
	42		17.2	30.4	177	96.6	13.0
	43		15.6	31.3	161	97.5	11.6
	44		14.4	31.6	177	98.5	11.4

Table C-34. Test 36 monitor gauge (chief of section) pressure-time values for sheep numbers 586 and 587.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		14.5	30.3	177	100.0	11.8
	46		14.9	30.2	178	99.6	12.0
	47		13.7	21.0	123	99.7	11.6
	48		14.3	30.7	172	99.8	11.4
	49		14.8	31.6	162	99.8	11.0
	50		14.9	27.2	161	98.8	10.8
	51		13.0	31.9	170	98.0	10.6
	52		14.0	31.5	173	99.4	11.2
	53		18.5	30.9	183	99.9	13.9
	54		13.7	30.6	162	98.9	11.6
	55		14.6	21.6	121	99.3	10.9
	56		14.5	30.3	177	99.6	12.0
	57		16.3	30.9	187	95.7	13.9
	58		15.4	30.1	173	99.3	13.2
	59		15.6	30.6	175	99.8	11.6
	60		15.7	30.5	181	97.8	12.1
	61		15.7	30.7	175	99.9	13.0
	62		15.1	30.7	174	99.7	12.1
	63		14.3	31.1	163	99.9	11.9
	64		15.1			87.2	11.7
	65		17.5	31.1	176		13.5
	66		14.5	31.0	167	92.7	11.4
	67		15.1	26.4	144	91.8	11.5
	68		13.3	30.7	169	99.7	10.3
	69		14.8	30.5	172	88.3	11.5
	70		16.1	31.0	182	87.2	11.8
	71		13.7	30.6	173	99.8	11.5
	72		15.6	31.4	173	96.4	11.2
	73		16.2	30.3	161	99.9	11.0
	74		13.3	30.2	162	90.0	10.6
	75		14.0	22.5	118	97.8	10.9
	76		15.2	31.0	179	99.8	11.7
	77		12.8	31.2	165	99.7	10.8
	78		15.2	30.5	174	97.9	12.1
	79		14.8	30.5	175	99.7	12.4
	80		14.8	30.6	183	98.8	12.5
	81		14.3	30.6	165	90.8	11.5
	82		14.4	30.5	169		11.7
	83		15.2	30.7	173	100.0	11.5
	84		14.6	30.9	173	99.3	12.1
	85		19.4	30.9	179	98.0	13.3
	86		19.4	30.4	187		13.6
	87		14.4	31.2	175	100.0	11.9
	88		12.9	31.3	165	99.6	10.6

Table C-34. Test 36 monitor gauge (chief of section) pressure-time values for sheep numbers 586 and 587.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		14.3	30.4	173	99.9	11.6
	90		14.9	30.4	176	99.3	12.2
	91		15.2	29.9	178	98.3	11.7
	92		14.2	30.3	182	99.6	12.1
	93		14.4	30.5	184	98.9	11.9
	94		14.1	30.6	168	88.3	10.9
	95		14.4	31.5	177		12.0
	96		15.0	31.7	176		11.7
	97		13.9	31.4	177	100.0	11.4
	98		14.4	31.1	180	89.7	11.8
	99		16.1	30.0	170	98.4	11.6
	100		14.3	31.0	169		11.7
Mean			14.9	30.4	170.4	97.4	11.7
SD			1.3	1.8	12.2	3.5	0.8

Table C-35. Test 37 monitor gauge (chief of section) pressure-time values for sheep numbers 590 and 591.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
9/21/95	1	1814	14.0	32.2	174	99.2	11.4
	2		15.2	31.5	186	99.8	12.5
	3		14.1	31.3	180	99.8	11.7
	4		16.5	31.5	194	97.0	14.0
	5		13.8	31.5	162	99.5	11.3
	6		15.4	31.9	170	99.8	12.6
	7		12.9	31.5	169	99.9	11.2
	8		18.6	30.4	196	100.0	15.1
	9		15.4	31.7	187	98.3	13.0
	10		15.6	29.6	172	100.0	12.2
	11		13.1	31.4	166	98.5	11.3
	12		15.6	30.6	175	99.3	11.7
	13		14.8	31.5	173	99.4	11.6
	14		16.3	31.2	187	99.2	13.4
	15		19.3	30.7	184	98.7	14.7
	16		15.7	32.7	192	100.0	12.5
	17		16.0			99.0	11.5
	18		14.0	31.7	169	99.9	11.2
	19		13.5	31.0	176	99.9	11.0
	20		14.5	31.6	171	99.2	11.3
	21		16.4	31.3	188	99.9	13.9
	22		16.0	31.6	181	99.9	12.6
	23		15.3	31.7	188	98.6	12.3
	24		12.8	31.7	163	96.3	10.9
	25		14.2	31.5	173	99.9	11.0
	26		17.5	30.6	189		13.7
	27		13.2	30.8	171	98.3	11.0
	28		15.1	31.1	182	99.5	12.8
	29		15.9	31.2	179		12.4
	30		13.9	30.8	176	99.8	10.8
	31		14.0	32.0	167	99.2	11.2
	32		15.9	31.3	189	100.0	12.7
	33		15.5	31.6	179	98.0	12.4
	34		15.7	30.8	180	97.8	12.8
	35		15.1	31.5	175	99.0	11.6
	36		14.3	31.5	170	98.3	11.4
	37		13.0	31.5	174	99.8	10.8
	38		13.5	21.7	123	92.0	11.3
	39		14.8	30.7	174	98.7	12.1
	40		15.5	31.7	182	99.6	12.0
	41		14.7	31.1	170	99.8	11.5
	42		15.4	32.0	169	99.6	11.1
	43		14.5	30.8	182	98.1	11.5
	44		13.4	32.0	163	99.2	10.4

Table C-35. Test 37 monitor gauge (chief of section) pressure-time values for sheep numbers 590 and 591.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		14.7	31.1	179	99.4	11.6
	46		16.0	31.5	183	98.6	12.7
	47		14.0	31.9	181	99.7	11.5
	48		15.8	30.9	185	98.9	13.2
	49		15.1	31.5	177	99.9	11.4
	50		16.0	31.7	188	98.9	13.0
	51		13.6	31.8	173	99.7	11.2
	52		14.7	31.5	173	93.2	11.4
	53		16.0	30.6	183	98.4	13.4
	54		15.2	32.0	179	99.3	11.6
	55		14.1	30.7	177		11.2
	56		15.0	31.5	178	99.6	12.1
	57		13.9	31.7	176		11.6
	58		17.0	31.2	194	98.4	14.5
	59		17.8	31.7	195		14.4
	60		15.0	26.8	147	97.3	11.1
	61		12.8	31.5	165	96.0	10.5
	62		13.8	21.9	120	99.8	10.7
	63		14.1	21.8	128	99.0	11.4
	64		14.2	31.5	182	99.9	12.1
	65		15.3	31.2	179	98.6	12.1
	66		16.6	30.9	175	97.0	12.2
	67		13.8	25.8	144	98.2	11.1
	68		17.8	30.8	181	96.6	13.9
	69		16.2	30.9	179	98.1	13.9
	70		18.4	31.1	199		14.9
	71		13.9	31.4	175	95.6	11.3
	72		17.6	31.4	192	99.5	12.1
	73		16.8	31.6	183	99.5	13.1
	74		15.1	21.6	124	99.1	11.8
	75		14.5	30.5	178	99.3	11.7
	76		15.9	28.1	180	98.9	12.6
	77		16.0	31.5	180	94.2	12.2
	78		14.4	22.1	124	99.3	11.0
	79		16.8	31.7	201	99.6	14.4
	80		14.9	31.6	176		12.2
	81		14.2	31.7	159	99.4	10.9
	82		15.6	31.8	182	99.8	12.4
	83		14.1	30.9	180	99.6	12.4
	84		13.1	25.4	135		10.9
	85		16.9	30.9	178	99.5	13.3
	86		15.5	31.4	183	99.3	12.8
	87		15.9	31.6	171	95.3	12.8
	88		15.1	31.3	177		11.8

Table C-35. Test 37 monitor gauge (chief of section) pressure-time values for sheep numbers 590 and 591.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		14.9	31.6	180	96.1	11.9
	90		18.2	27.4	187	99.9	14.4
	91		15.6	31.9	181	99.6	12.6
	92		14.5			99.0	11.5
	93		17.3	31.2	186	98.7	13.9
	94		14.8	31.8	175	97.9	12.0
	95		16.8	31.3	183	98.3	13.0
	96		14.4	31.9	188	99.5	12.3
	97		14.6	31.5	180	99.8	11.6
	98		15.8	31.5	184	100.0	12.0
	99		16.4	31.3	188	99.6	13.3
	100		13.4	22.3	124	94.6	11.6
Mean			15.2	30.5	174.7	98.7	12.2
SD			1.4	2.5	16.6	1.6	1.1

Table C-36. Test 38 monitor gauge (chief of section) pressure-time values for sheep numbers 592 and 593.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
10/05/95	1	2722	20.2	22.1	161	95.3	15.4
	2		19.8	30.7	251		15.6
	3		21.4	31.4	249		16.8
	4		19.4	31.7	243		15.1
	5		21.9	32.4	252	99.6	16.7
	6		22.8	30.6	253	100.0	18.7
	7		23.9	31.4	255	99.5	17.6
	8		19.4	31.2	229		15.3
	9		21.6	30.7	244	92.1	15.5
	10		19.8	30.9	237		16.3
	11		20.0	31.0	247		16.3
	12		24.1	31.3	258	100.0	19.9
	13		21.2	30.8	245	99.7	15.1
	14		24.0	31.6	253	99.9	17.1
	15		24.8	31.8	248	99.3	18.2
	16		20.4	30.5	229	98.4	15.1
	17		26.1	30.5	251		18.4
	18		21.2	31.2	244	91.2	16.9
	19		19.6	31.8	238	92.2	14.7
	20		21.1	31.2	240	99.6	16.0
	21		21.0	31.1	246		16.5
	22		20.0	31.3	247	99.6	15.0
	23		19.2	30.4	232	99.9	15.3
	24		20.9	31.1	253	99.8	17.2
	25		21.0	32.1	253	99.7	16.8
Mean			21.4	30.8	242.3	98.0	16.5
SD			1.9	1.9	18.7	3.1	1.3

Table C-37. Test39 monitor gauge (chief of section) pressure-time values for sheep numbers 594 and 595.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
10/10/95	1	2722	19.2	32.8	250		15.7
	2		18.4	31.4	226	88.0	13.8
	3		25.1	30.4	251	94.1	19.5
	4		21.8	31.5	241	95.6	16.5
	5		20.9	31.5	235	98.6	15.1
	6		22.6	31.0	255	99.6	18.2
	7		21.8	30.4	240	99.8	16.3
	8		21.6	32.0	253	95.0	16.7
	9		21.2	31.6	247	99.7	16.2
	10		24.7	31.4	250		17.0
	11		20.3	31.6	246	99.7	15.7
	12		21.6	30.6	245	99.1	16.3
	13		20.4	30.4	235	95.6	15.2
	14		20.7	30.2	245		16.8
	15		19.4	31.0	228	99.8	14.4
	16		24.6	31.2	253	99.7	17.7
	17		23.8	31.0	247	99.8	17.9
	18		22.4	32.2	256	99.9	17.1
	19		22.0	30.4	255	100.0	17.9
	20		21.3	30.2	234	99.9	15.2
	21		20.0	30.8	241	99.9	15.6
	22		20.5	31.0	242	99.3	16.6
	23		21.0	30.8	244	99.3	15.8
	24		17.5	30.6	224	97.4	13.4
	25		20.4	30.1	240	99.8	15.7
Mean			21.3	31.0	243.3	98.2	16.3
SD			1.9	0.7	9.1	2.9	1.4

Table C-38. Test 40 monitor gauge (chief of section) pressure-time values for sheep numbers 596 and 597.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
10/17/95	1	2722	20.4	21.2	159		14.9
	2		20.2	30.7	239	97.2	15.3
	3		20.1	30.4	238	99.1	16.2
	4		21.6	30.3	239	99.8	16.6
	5		20.5	31.2	237	99.9	16.1
	6		20.6	31.9	247	99.7	15.7
	7		20.9	31.3	236	88.5	16.2
	8		21.1	31.2	237	99.6	15.8
	9		20.9	31.3	245		16.4
	10		20.4	30.9	235		15.9
	11		24.6	21.4	166	100.0	17.6
	12		18.5	31.4	228		15.7
	13		20.5	30.3	234		14.9
	14		19.8	31.2	231	91.2	14.8
	15		20.1	30.4	248	99.8	15.9
	16		18.9	30.7	235		14.5
	17		23.9	30.7	253	99.8	19.4
	18		22.4	31.4	244	98.5	17.5
	19		21.2	30.2	252	99.7	17.5
	20		21.6	31.3	250	99.9	17.3
	21		19.6	30.1	230	99.8	14.7
	22		22.2	31.5	240	99.1	17.0
	23		21.4	31.4	249	94.0	16.0
	24		22.4	31.0	256	99.8	18.1
	25		21.7	31.2	260	100.0	17.4
Mean			21.0	30.2	235.5	98.2	16.3
SD			1.4	2.7	23.5	3.3	1.2

Table C-39. Test 41 monitor gauge (chief of section) pressure-time values for sheep numbers 598 and 599.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
10/19/95	1	2722	18.8	31.0	229		13.9
	2		19.1	31.4	246	99.9	15.1
	3		18.8	30.3	231	96.8	15.1
	4		19.7	32.3	239	100.0	14.6
	5		23.6	31.0	253	98.2	16.6
	6		20.4	30.7	234	99.5	14.9
	7		20.4	30.8	242	99.3	16.8
	8		20.3	32.0	252	99.3	17.1
	9		18.4	31.3	231	99.3	14.8
	10		22.3	30.7	241	99.5	17.4
	11		19.0	21.4	155	94.0	14.7
	12		19.4	30.5	246	99.7	15.6
	13		20.2	31.3	239	95.8	16.1
	14		23.4	31.8	261	96.2	18.7
	15		21.8	31.1	258	99.0	16.9
	16		23.4	31.9	257	99.9	18.7
	17		24.1	31.9	260	97.7	19.1
	18		19.9	32.0	242	99.7	15.7
	19		20.1	31.0	230	90.5	14.4
	20		21.4	30.7	249	99.9	16.5
	21		21.7	30.1	251	97.9	17.2
	22		21.6	31.0	251	98.0	17.2
	23		22.7	31.0	257	98.8	16.2
	24		20.0	31.8	251	99.1	15.8
	25		21.4	31.3	248	99.6	16.3
Mean			20.9	30.8	242.1	98.2	16.2
SD			1.7	2.0	20.6	2.2	1.4

Table C-40. Test 42 monitor gauge (chief of section) pressure-time values for sheep numbers 600 and 601.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
10/24/95	1	2722	20.5	30.7	242	99.9	15.7
	2		19.0	31.8	245	99.8	15.1
	3		25.0	31.0	251	99.5	18.0
	4		18.8	31.0	241	99.8	15.1
	5		19.4	31.0	252		15.7
	6		21.1	31.7	249		15.2
	7		23.1	30.8	251	99.4	17.4
	8		25.3	31.8	245	100.0	16.3
	9		23.8	31.1	259	90.7	18.0
	10		20.2	31.3	251	99.9	17.0
	11		18.9	31.8	251	99.4	14.7
	12		19.9	21.1	161	99.5	15.6
	13		20.8	32.0	252	97.9	16.7
	14		21.7	30.9	251	99.0	16.5
	15		22.1	30.8	243	99.2	16.3
	16		22.6	30.8	266	98.9	17.9
	17		23.6	32.6	259	99.8	16.9
	18		19.6	30.3	230	96.4	15.8
	19		23.6	31.8	246	99.8	16.4
	20		21.5	31.4	242	98.7	16.7
	21		19.7	30.3	242		16.5
	22		23.7	31.2	240	100.0	17.1
	23		20.4	31.1	241	98.3	15.9
	24		23.8	31.3	243	98.4	17.1
	25		20.1	31.7	246	98.4	15.6
Mean			21.5	30.9	244.0	98.8	16.4
SD			2.0	2.1	18.8	2.0	0.9

Table C-41. Test 43 monitor gauge (chief of section) pressure-time values for sheep numbers 604 and 605.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
11/9/95	1	2268	17.0	31.0	217		14.1
	2		16.1	31.0	190	99.8	12.5
	3		18.0	31.2	217	99.8	14.5
	4		16.6	31.0	209	99.4	13.7
	5		19.0	31.1	200	94.7	13.3
	6		15.9	31.8	211		13.4
Mean			17.1	31.2	207.3	98.4	13.6
SD			1.2	0.3	10.6	2.5	0.7

Table C-42. Test 44 monitor gauge (chief of section) pressure-time values for sheep numbers 606 and 607.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
11/14/95	1	1814	16.0	31.9	191	99.7	12.8
	2		16.4	32.3	175	97.1	13.4
	3		14.5	31.5	174	99.7	11.3
	4		19.4	31.5	187	97.5	15.4
	5		14.3	31.8	173	95.4	12.2
	6		16.6	32.2	177	99.4	14.1
	7		16.8	31.1	185	95.3	14.0
	8		13.8	31.8	166	98.9	11.7
	9		15.4	26.4	136	96.1	10.7
	10		16.8	31.8	166	98.9	12.2
	11		15.6	31.8	176	99.5	12.5
	12		15.4	26.3	139	99.8	10.9
	13		14.3	21.7	127	99.9	12.1
	14		14.6	31.0	171	98.5	11.2
	15		16.0	21.5	129	94.2	12.3
	16		15.9	32.0	168	97.0	11.8
	17		18.3	32.1	181	99.7	15.0
	18		16.4	31.8	174	98.1	11.8
	19		13.8	32.2	174	99.8	11.6
	20		14.5	32.8	168	95.2	11.1
	21		14.2	32.0	163		11.0
	22		15.8	31.0	175	99.1	12.3
	23		14.2	22.2	119	94.6	10.7
	24		15.0	22.1	123	93.2	11.2
	25		13.9	28.8	152	94.0	10.8
	26		18.0	31.3	180	99.7	13.8
	27		15.3	31.4	175	99.0	12.0
	28		15.6	31.9	183	99.7	12.1
	29		18.3	31.2	186	96.7	13.9
	30		17.6	30.9	171	98.3	13.4
	31		15.2	31.0	174	99.6	12.1
	32		15.3	26.9	141	98.1	10.3
	33		15.7	31.0	176	95.2	12.4
	34		16.9	30.9	181	95.0	13.2
	35		16.5	21.9	129	99.2	12.2
	36		14.6	31.4	165	99.7	11.7
	37		15.9	31.4	167	98.9	12.6
	38		18.3	30.7	193	98.5	14.6
	39		15.0	31.0	172	95.2	11.5
	40		15.4	30.9	179	98.4	12.4
	41		15.8	22.1	124	99.5	12.1
	42		14.3	32.2	187	91.2	12.1
	43		15.6	30.8	164	94.6	11.4
	44		14.7	31.2	171	99.8	11.4

Table C-42. Test 44 monitor gauge (chief of section) pressure-time values for sheep numbers 606 and 607.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		19.4	30.7	184	98.1	14.7
	46		15.6	31.6	175	95.1	12.2
	47		14.0			99.3	11.3
	48		16.7	30.9	180	97.0	12.7
	49		17.0	31.0	179	94.7	12.8
	50		17.0	31.0	179	94.7	12.8
	51			32.1	184	97.5	14.5
	52		14.2	31.0	169	99.9	10.6
	53		14.6	31.2	173	99.4	11.6
	54		16.6	30.8	186	99.9	12.6
	55		15.0	31.6	171	89.9	11.3
	56		15.4	31.4	182	98.4	12.0
	57		14.2	30.8	168	99.2	10.9
	58		16.0	21.2	125	98.6	11.3
	59		14.7	31.4	171	98.4	11,4
	60		15.9	21.3	126	98.5	12.4
	61		15.0	31.7	164	98.3	11.5
	62		15.0	30.9	172	99.7	11.5
	63		16.2	31.0	169	99.3	11.3
	64		15.7	31.3	180	94.2	11.7
	65		13.4	31.7	161	99.4	10.9
	66		14.3	31.0	165	93.9	11.3
	67		16.3	31.7	168	99.2	12.0
	68		13.2			98.2	11.1
	69		18.1	30.8	194	100.0	14.1
	70		15.0	21.8	127	99.0	12.4
	71		17.6	30.5	186	97.9	14.0
	72		15.2	30.8	177	98.6	12.0
	73		14.9	31.1	172	98.3	11.7
	74		15.0	31.5	171	97.7	11.8
	75		17.6	31.3	184	97.3	14.1
	76		14.6	30.9	174	99.5	11.4
	77		15.4	31.3	176	100.0	12.3
	78		16.6	21.8	126	100.0	12.6
	79		16.5	31.4	165	99.1	10.9
	80		16.6	31.5	182	99.0	12.3
	81		15.8	31.0	175	97.5	12.8
	82		13.5	31.8	167	99.4	10.9
	83		13.9	31.4	169	93.4	11.2
	84		17.1	31.4	183	99.9	13.1
	85		14.2			99.9	11.2
	86		16.4	21.6	125	92.2	11.7
	87		16.5	31.5	186	98.4	11.9
	88		16.5	31.5	186	98.4	11.9

Table C-42. Test 44 monitor gauge (chief of section) pressure-time values for sheep numbers 606 and 607.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		13.7	30.9	171	100.0	11.2
	90		16.0	31.4	175	98.0	11.4
	91		15.6	30.5	181	99.7	12.9
	92		15.2	31.4	173	98.9	11.5
	93		15.4	30.6	172	99.9	11.1
	94		19.2	31.5	182	97.2	12.3
	95		18.0	31.1	192	99.1	14.3
	96		17.4	30.8	181	99.2	13.3
	97		14.4	30.8	170	98.0	11.5
	98		16.0	21.9	129	97.9	12.6
	99		14.6	21.9	129	99.2	12.4
	100		16.7	31.3	180	99.6	11.4
Mean			15.7	29.9	167.8	97.9	12.2
SD			1.4	3.4	19.2	2.2	1.1

Table C-43. Test 45 monitor gauge (chief of section) pressure-time values for sheep numbers 608 and 609.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
11/16/95	1	2268	17.6	31.4	221	99.6	14.1
	2		20.4	31.1	220	99.9	16.6
	3		18.7	32.2	213	99.6	13.4
	4		18.7	31.4	208	99.6	14.3
	5		18.1	31.7	213	100.0	12.8
	6		17.0	32.1	202		13.1
Mean			18.4	31.7	212.8	99.7	14.1
SD			1.2	0.4	7.2	0.2	1.4

Table C-44. Test 46 monitor gauge (chief of section) pressure-time values for sheep numbers 610 and 611.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
11/21/95	1	1814	16.1	31.2	182	90.5	12.6
	2		14.1	32.1	174	99.5	11.8
	3		15.7	32.2	166	97.4	11.6
	4		15.4	31.9	172	98.4	11.6
	5		17.9	31.4	190	98.7	13.9
	6		14.7	33.0	188	97.6	11.6
	7		15.7	28.3	176	99.9	12.5
	8		15.1	28.4	174	98.4	12.4
	9		16.4	31.0	184	100.0	12.3
	10		16.6	32.0	188	95.3	13.9
	11		16.4	30.9	179	99.2	13.2
	12		15.1	31.4	178	95.0	12.4
	13		15.7	22.0	133	92.3	13.1
	14		15.3				12.8
	15		14.4	23.7	136	97.6	11.2
	16		14.4	21.9	124	99.0	11.6
	17		17.1	31.0	177	93.7	12.3
	18		16.0			99.9	12.0
	19		14.5	31.5	172	95.7	11.4
	20		17.2	28.0	180		13.7
	21		19.5			99.8	15.1
	22		20.4	30.9	177	94.6	12.0
	23		19.0	30.7	180	97.6	14.4
	24		15.3	32.0	178	99.9	11.8
	25		16.6	31.4	189	99.6	13.0
	26		14.5	22.2	129	100.0	11.6
	27		15.1	31.6	178	99.2	11.5
	28		14.6	22.0	126	94.7	11.6
	29		15.1	31.7	172	95.6	11.5
	30		14.0	31.5	166	96.0	11.1
	31		16.3	31.7	179	97.6	13.4
	32		16.0	31.0	168	99.5	11.9
	33		16.2	31.4	176	88.3	13.0
	34		14.2	30.0	162	99.9	11.5
	35		14.4	22.0	123	95.8	11.1
	36		16.4	30.9	178	99.3	12.5
	37		15.1	31.9	173	96.5	11.4
	38		16.4	31.5	177	93.6	11.4
	39		15.2	22.1	122	93.6	11.3
	40		15.2	31.2	170	99.2	11.8
	41		14.1	31.0	167	99.3	11.5
	42		15.0	31.8	169	99.7	11.8
	43		16.7	32.0	181	98.9	14.5
	44		15.1	31.1	170	95.4	11.8

Table C-44. Test 46 monitor gauge (chief of section) pressure-time values for sheep numbers 610 and 611.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		16.0	31.1	171	98.9	11.8
	46		16.0	31.0	177	99.6	11.8
	47		14.1	22.3	121	94.3	11.0
	48		14.8	22.2	125	98.8	11.5
	49		14.2	30.9	163	93.4	11.1
	50		14.3	24.1	124	96.5	10.6
	51		14.4	31.0	180	97.5	12.0
	52		17.1	30.9	190	98.8	12.0
	53		15.9	31.3	182	99.4	12.2
	54		14.3	21.8	124	99.7	11.5
	55		18.9	31.1	194	94.3	15.1
	56		18.1	30.4	173	96.2	13.1
	57		19.0	31.7	181	99.2	14.8
	58		15.7	31.1	167	93.5	11.2
	59		14.4	31.3	176	98.9	11.8
	60		18.1	30.4	179	98.1	14.1
	61		14.2	31.3	178	98.7	11.5
	62		16.1	31.3	169	94.6	11.6
	63		15.1	22.2	124	98.9	11.6
	64		15.5	30.8	172	99.9	11.8
	65		16.4	30.6	180	99.8	12.2
	66		15.4	30.9	180	100.0	12.9
	67		16.3	31.2	170		12.2
	68		14.9	22.0	127	99.4	11.0
	69		15.1	32.1	171	99.8	11.3
	70		15.8	31.0	179	100.0	12.6
	71		15.8	21.4	123	92.5	11.4
	72		15.7	31.1	171	89.9	11.2
	73		15.2	31.0	167	100.0	11.6
	74		16.1	31.4	185	98.4	12.6
	75		14.6	30.8	176	96.8	11.3
	76		15.6	31.0	169	98.8	11.7
	77		16.5	30.6	182	93.4	12.9
	78		16.2	30.7	187	98.1	13.6
	79		15.4	31.6	166	98.6	11.2
	80		15.1	31.8	179	95.1	12.2
	81		16.2	31.0	179	91.8	14.3
	82		14.3	31.0	178	98.3	11.9
	83		16.9	22.0	132	99.6	13.2
	84		18.0	30.9	181	93.9	12.9
	85		13.3	22.0	125	99.3	10.9
	86		16.3	30.9	180	99.9	12.3
	87		15.6	31.2	178	99.4	12.3
	88		17.6	31.0	180	95.5	13.1

Table C-44. Test 46 monitor gauge (chief of section) pressure-time values for sheep numbers 610 and 611.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		17.2	30.9	185	98.1	13.6
	90		14.8	30.7	178	98.3	11.9
	91						
	92		15.8	32.1	177	96.8	11.5
	93		15.4	31.1	169	93.4	11.8
	94		16.6	31.0	181	98.7	13.5
	95		14.4	30.9	175	99.6	12.1
	96		13.7	31.3	160	94.0	10.6
	97		15.4	31.9	182		12.2
	98		17.5	30.9	170	96.7	12.3
	99		14.8	30.8	169	99.6	11.9
	100		16.1	31.4	174	94.8	12.9
Mean			15.8	29.6	167.9	97.3	12.2
SD			1.3	3.4	19.9	2.7	1.0

Table C-45. Test 47 monitor gauge (chief of section) pressure-time values for sheep numbers 612 and 613.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
11/29/95	1	1814	16.8	31.4	185	99.2	13.0
	2		16.6	32.6	191	92.6	13.9
	3		14.7	31.4	181	98.6	12.4
	4		15.1	31.4	180	99.1	12.1
	5		15.2	31.5	189	100.0	13.1
	6		16.2	31,3	180	99.9	12.6
	7		15.8	31.5	179	96.6	12.6
	8		15.2	32.2	172	96.7	12.4
	9		15.9	29.8	178	99.7	13.1
	10		18.7	31.4	191	99.6	15.6
	11		15.7	31.7	191	99.4	12.4
	12		16.5	22.5	124	99.6	11.1
	13		17.6	31.3	178	98.2	13.5
	14		19.3	31.5	183		15.1
	15		15.2	31.3	172	99.7	11.9
	16		15.4	32.0	170	96.5	11.3
	17		14.5	22.0	124		11.8
	18		15.1	22.4	126	96.8	11.5
	19		16.1	18.9	123	99.8	11.7
	20		15.4	31.7	180	95.8	12.6
	21		15.8	31.5	164	95.6	11.1
	22		18.1	31.9	181	97.3	12.9
	23		17.9	31.4	178	94.0	13.2
	24		15.0	31.7	181	97.2	13.1
	25		16.0	31.7	182	96.1	12.4
	26		16.0	30.8	169	96.0	11.4
	27		13.7	31.7	158	100.0	10.6
	28		15.1	31.2	184	99.0	12.3
	29		13.6	32.3	164	92.9	10.9
	30		15.2	22.1	132	90.3	12.0
	31		13.9	27.0	138	95.7	10.9
	32		17.3	31.9	168	98.1	12.0
	33		15.0	31.5	177	98.7	11.3
	34		18.3	30.5	186	100.0	14..3
	35		14.0	31.2	174	95.7	11.3
	36		15.2	32.5	173	99.3	12.0
	37		14.9	31.4	166	96.0	11.0
	38		16.8	29.8	190	99.4	13.7
	39		14.2	32.0	177	99.7	12.1
	40		19.8	31.9	191	99.2	13.3
	41		15.9	31.4	182	98.8	12.4
	42		19.4	30.5	184	97.7	14.3
	43		15.7	31.3	172		11.5
	44		14.8	22.1	124		11.4

Table C-45. Test 47 monitor gauge (chief of section) pressure-time values for sheep numbers 612 and 613.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		17.3	28.4	178	96.2	11.8
	46		16.1	30.8	187	89.2	12.9
	47		14.3	27.1	137	99.6	11.3
	48		18.5	31.1	190	99.8	15.2
	49		15.0	21.1	126	92.8	12.0
	50		15.2	28.0	166	98.0	11.7
	51		15.9	31.1	183	99.2	12.0
	52		17.8			99.5	12.2
	53		16.1	21.6	130	99.6	12.6
	54		16.1	31.2	181	99.8	13.1
	55		17.2	31.1	180	95.8	13.5
	56		18.0	31.1	178	95.4	13.5
	57		14.8	21.9	122	99.4	11.4
	58		14.9	31.8	182	97.8	11.8
	59		15.1	28.2	170	95.2	11.1
	60		15.5	32.9	180	94.4	11.9
	61		17.3	31.4	171	99.1	13.9
	62		14.2	31.9	167	95.2	10.8
	63		18.9	31.1	183	99.4	13.1
	64		15.4	31.9	166	99.4	11.4
	65		16.0	31.8	176	99.2	12.1
	66						
	67		17.9	31.0	187	95.6	14.2
	68		16.8	31.1	178	95.5	12.4
	69		17.9	31.2	192	97.4	14.2
	70		17.8	21.9	136	93.5	13.9
	71		18.6	30.8	182	96.4	13.3
	72		16.8	29.9	175	98.0	12.5
	73		17.1	31.1	185	94.8	12.4
	74		15.8	21.5	128	92.4	11.6
	75		16.7	30.6	185	97.2	13.5
	76		14.9	22.1	129	98.0	11.6
	77		17.1	28.1	169	97.8	13.0
	78		16.6	31.3	169	99.1	12.2
	79		16.3	31.0	175	99.0	13.6
	80		16.5	31.0	175	99.6	12.7
	81		16.6	31.6	174	94.0	12.9
	82		16.1	31.0	176	91.0	11.8
	83		14.7	31.7	176	98.9	12.2
	84		17.3	31.2	190	99.6	13.6
	85		18.2	30.8	187	98.6	13.3
	86		15.8	18.2	121	99.8	12.0
	87		16.3	31.3	184	99.6	13.6
	88		15.7	31.0	173	96.1	12.2

Table C-45. Test 47 monitor gauge (chief of section) pressure-time values for sheep numbers 612 and 613.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		14.6	21.8	126	99.5	11.4
	90		13.8	21.4	118	100.0	11.0
	91		14.8	21.8	125	99.1	11.8
	92		16.1	21.9	119	96.0	10.7
	93		15.5	32.9	174	97.8	12.0
	94		14.4	21.4	127	98.8	12.2
	95		13.7	31.4	161	100.0	11.1
	96		16.7	31.0	185	87.1	13.0
	97		18.4	21.7	133	99.5	12.4
	98		15.1	31.2	177	98.8	12.3
	99		15.4	28.6	168	87.1	12.2
	100		16.2	30.1	178	100.0	13.2
Mean			16.1	29.2	167.2	97.3	12.4
SD			1.4	4.0	22.3	2.9	1.0

Table C-46. Test 48 monitor gauge (chief of section) pressure-time values for sheep numbers 614 and 615.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
11/30/95	1	2268	18.4	31.4	215	97.6	13.9
	2		16.7	31.0	210	97.4	13.8
	3		19.1	31.5	205	99.2	13.4
	4		18.1	31.0	211	91.8	14.5
	5		20.2	31.0	210	99.8	15.2
	6		18.6	21.6	148	95.7	14.4
Mean			18.5	29.6	199.8	96.9	14.2
SD			1.2	3.9	25.6	2.9	0.6

Table C-47. Test 49 monitor gauge (chief of section) pressure-time values for sheep numbers 616 and 617.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
12/5/95	1	1814	15.5	31.3	182	98.4	12.2
	2		14.6	31.2	172	99.9	10.9
	3		14.8	32.2	171	99.0	11.6
	4		14.5	31.8	160	98.5	11.7
	5		14.7	31.6	181	95.7	12.7
	6		16.6	31.7	179	93.7	12.9
	7		14.5	31.6	168	95.7	11.8
	8		17.4	32.0	179	99.5	12.6
	9		17.2	31.7	175	99.8	11.8
	10		13.2	31.6	175	99.9	12.5
	11		14.4	26.4	149	96.9	11.8
	12		14.0	31.5	164	98.0	11.5
	13		17.3	31.6	189	98.8	12.6
	14		16.7	31.7	181	97.7	13.5
	15		14.0	28.5	153	100.0	11.8
	16		14.6	31.7	172	99.7	12.2
	17		19.6	30.9	189	99.0	16.1
	18		17.0	30.7	185	99.4	13.4
	19		16.3	31.3	183	93.1	13.1
	20		17.4	31.5	191	99.9	14.4
	21		14.8	18.6	117	99.0	10.9
	22		14.8	21.7	132	94.2	11.9
	23						
	24		15.2	30.9	183	96.6	12.1
	25		18.4	31.3	179	97.0	12.8
	26		16.4	30.1	176	98.8	11.7
	27		17.9	31.1	172	95.0	12.5
	28		14.1	21.7	124	94.4	11.1
	29		16.1	21.8	125	100.0	12.4
	30		15.0	30.9	171	97.0	12.0
	31		16.1	22.2	125	94.3	11.6
	32		14.6	30.6	177	100.0	10.6
	33		18.0	30.6	180	99.4	14.3
	34		15.6	31.0	166	95.1	11.4
	35		15.2	21.5	122	100.0	10.8
	36		17.8	30.5	192	98.7	14.2
	37		15.9	30.5	165	99.2	12.4
	38		14.8	31.2	167	90.6	11.5
	39		16.2	31.2	169	99.5	11.0
	40		16.0	30.8	176	99.4	12.2
	41		16.7	28.4	160	99.6	12.5
	42		14.3	30.9	166	99.4	10.8
	43		16.7	31.1	172	93.8	12.5
	44		15.1	31.2	159	93.8	10.9

Table C-47. Test 49 monitor gauge (chief of section) pressure-time values for sheep numbers 616 and 617.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		15.0	31.5	165	93.3	11.1
	46		16.0	31.0	179	96.3	12.6
	47		14.4	30.8	174	95.0	11.3
	48		16.3	31.4	190	97.6	13.1
	49		15.0	30.3	187	91.2	12.0
	50		16.1	30.9	178	100.0	11.6
	51		21.0	31.1	194	100.0	16.1
	52		14.5	30.9	170	97.1	11.4
	53		14.9	21.9	126	91.0	11.6
	54		15.9	30.5	162	99.3	11.2
	55		14.8	30.6	178	95.5	12.3
	56		15.5	30.9	180	92.5	12.3
	57		16.2	31.4	181	98.8	13.0
	58		13.9	31.8	171	100.0	11.4
	59		13.2	21.8	124	99.6	11.1
	60		15.0	22.6	126	99.7	11.7
	61		16.4	30.8	170	93.5	11.4
	62		15.3	30.9	169	95.8	12.3
	63		15.2	27.5	170	99.8	11.5
	64		16.1	30.8	172	99.0	11.4
	65		13.2	21.6	123	98.8	10.8
	66		15.9	30.8	181	99.2	12.3
	67		16.6			98.6	12.8
	68		14.5	30.9	176	98.7	11.9
	69		14.3	22.0	122	98.7	11.2
	70		15.3	30.5	175	94.4	11.9
	71		14.5	31.0	159	97.3	10.5
	72		19.1	30.5	181	97.6	14.9
	73		15.9	30.9	177	98.6	11.8
	74		13.3	32.0	163	98.3	10.3
	75		17.7	31.2	178	99.6	13.2
	76		17.4	31.3	169	94.4	12.2
	77		15.1	31.1	161	98.5	11.0
	78		16.3	30.8	182	98.6	12.6
	79		18.6	30.4	197	99.1	14.8
	80		14.4	21.6	125	93.9	10.8
	81		16.0	30.8	170	98.8	11.6
	82		15.1	30.8	171	99.3	11.1
	83		16.4	30.3	171	95.1	11.6
	84		15.8	30.8	180	99.8	12.6
	85		16.6	27.7	166	94.8	12.8
	86		18.0	21.3	132	91.6	13.3
	87		14.3	13.6	172	98.6	11.3
	88		15.8	30.7	179	96.2	12.8

Table C-47. Test 49 monitor gauge (chief of section) pressure-time values for sheep numbers 616 and 617.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		17.4	30.9	178	99.3	12.2
	90		14.4	30.8	177	99.7	11.8
	91		15.0	30.8	162	92.8	11.4
	92		15.6	30.6	175	92.4	12.1
	93		15.2	31.3	162	95.1	10.9
	94		14.3	31.2	174	98.3	11.3
	95		17.4	30.2	177	97.4	12.1
	96		15.2	31.0	164	94.2	11.2
	97		14.2	31.4	163	99.6	10.6
	98		15.2	30.9	169	99.0	11.9
	99		14.6	30.8	171		13.6
	100		16.1	31.5	173	98.4	11.2
Mean			15.7	29.4	167.3	97.3	12.1
SD			1.4	3.7	18.8	2.6	1.1

Table C-48. Test 50 monitor gauge (chief of section) pressure-time values for sheep numbers 618 and 619.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
12/7/95	1	2268	19.6	31.3	220	98.5	14.3
	2		20.0	30.9	223	96.0	15.8
	3		23.4	31.3	222	99.7	16.4
	4		17.8	30.6	222	100.0	14.2
	5		18.3	32.3	212	100.0	14.0
	6		18.6	32.1	219	100.0	14.3
Mean			19.6	31.4	219.7	99.0	14.8
SD			2.0	0.7	4.0	1.6	1.0

Table C-49. Test 51 monitor gauge (chief of section) pressure-time values for sheep numbers 620 and 621.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
12/12/95	1	1814	18.8	31.2	187	100.0	14.6
	2		16.7	31.5	179	97.1	13.4
	3		19.0	31.5	187	99.8	13.5
	4		14.9	31.3	174	98.4	11.7
	5		14.5	32.6	154	95.8	10.9
	6		16.8	31.7	171	99.4	13.1
	7		16.0	31.1	171	99.6	10.8
	8		14.7	28.5	175	99.1	12.0
	9		14.9	31.9	170	96.1	11.5
	10		16.3	30.9	182	98.2	11.9
	11		18.0	31.6	176	99.3	12.5
	12		15.8	31.5	175	99.8	11.9
	13		16.8	22.2	127	97.7	11.6
	14		16.7	31.1	178.5	97.0	13.2
	15		16.2	29.6	170	99.6	12.0
	16		17.6	27.6	166	95.2	13.0
	17		15.3	21.5	124	99.9	10.6
	18		15.5	22.1	125	95.4	11.6
	19		14.2				11.0
	20		14.7	31.2	183	95.8	11.8
	21		14.8	32.2	166	99.4	11.9
	22		17.1	30.9	170	99.3	11.7
	23		18.1	31.3	203	97.9	15.5
	24		17.8	27.3	185	99.2	14.5
	25		15.0	31.2	172	91.6	11.5
	26		16.7	30.9	166	97.2	13.1
	27		16.4			99.8	12.3
	28		14.9	27.2	143	96.0	11.6
	29		14.4	31.9	168	96.8	11.0
	30		15.8	31.4	176		12.1
	31		15.6	29.4	170	93.3	11.9
	32		16.3			100.0	12.6
	33		16.9	30.9	176	95.9	12.9
	34		15.4	31.6	177	95.0	12.1
	35		14.1	31.2	172	99.4	10.9
	36		14.9	31.2	168	91.9	11.2
	37		15.1	31.3	177	97.2	11.7
	38		19.5	31.1	191	99.7	15.2
	39		17.1	26.9	152	99.9	11.8
	40		15.9	31.1	178	97.8	12.9
	41		16.2	21.6	126	99.2	11.7
	42		15.4	30.7	179	99.2	12.2
	43		17.0	30.8	186	97.5	13.2
	44		17.6	30.8	187	95.6	14.2

Table C-49. Test 51 monitor gauge (chief of section) pressure-time values for sheep numbers 620 and 621.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		15.9	21.9	130	91.2	12.2
	46		17.6	30.9	188	93.6	13.3
	47		14.5	31.0	181	91.2	11.6
	48		15.2	30.8	177	91.4	11.9
	49		17.4	30.9	187	94.5	12.6
	50		16.2	22.0	124	96.7	11.8
	51		15.8	31.3	173	99.5	11.8
	52		18.3	22.0	131	99.5	12.9
	53		14.9	21.4	125	99.1	12.4
	54		16.2	31.2	178	99.3	12.1
	55		15.2	21.6	116	99.6	11.2
	56		14.5	31.0	163	94.0	11.0
	57		16.3			100.0	11.9
	58		14.7	31.1	172	99.4	11.8
	59		16.6	31.2	175	98.5	12.7
	60		15.3	31.3	167	99.9	11.8
	61		17.4	30.9	186	99.4	12.7
	62		20.0	31.5	182	97.9	14.0
	63		15.1	24.0	137	97.9	11.7
	64		15.6	27.8	165	97.4	11.4
	65		16.7	26.9	165	97.1	14.4
	66		16.9	31.0	181	99.9	11.7
	67		13.8	22.0	122	96.3	11.0
	68		15.0	31.2	170	95.4	11.0
	69		15.7	31.5	178	99.1	11.8
	70		19.3	31.3	180	98.9	13.9
	71		14.7	32.0	163	95.4	10.9
	72		15.0	31.5	178	98.8	11.6
	73		16.9	30.8	176	99.9	12.0
	74		14.0	31.2	172	88.1	11.1
	75		17.7	30.9	179	99.6	14.0
	76		14.9	21.9	127	98.8	12.0
	77		15.0	31.1	170	99.6	11.3
	78		14.8	31.2	164	99.9	10.9
	79		16.8	30.8	184	98.1	13.3
	80		15.8	31.0	176	98.2	11.1
	81						
	82		16.3	30.9	183	99.2	12.2
	83		13.7	31.2	179	99.9	11.8
	84		15.8	30.6	181	99.4	12.6
	85		16.0	31.3	178	99.0	13.1
	86		15.0	26.3	140	95.4	11.8
	87		16.1	22.0	127	100.0	12.8
	88		14.6	30.0	176	99.8	11.9

Table C-49. Test 51 monitor gauge (chief of section) pressure-time values for sheep numbers 620 and 621.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		14.6	21.8	122	94.6	11.9
	90		16.8			100.0	12.8
	91		16.6	30.7	169	95.5	12.6
	92		15.4	30.9	174	99.8	11.9
	93		17.8	27.5	177	94.6	13.4
	94		15.2	18.6	122	98.6	11.6
	95		15.4	31.7	180	98.7	12.2
	96		18.5	31.0	180	96.4	14.8
	97		18.6	31.0	187	98.6	13.7
	98		16.4	32.1	174	92.2	11.8
	99		20.0	31.1	188	100.0	14.1
	100		16.5	30.8	184	97.8	13.5
Mean			16.1	29.3	167.3	97.6	12.3
SD			1.4	3.5	20.4	2.6	1.1

Table C-50. Test 52 monitor gauge (chief of section) pressure-time values for sheep numbers 622 and 623.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
12/14/95	1	2268	19.3	31.7	227		14.0
	2		17.5	31.3	210	100.0	13.3
	3		17.6	31.7	218	99.3	14.8
	4		19.0	31.0	221	99.3	14.6
	5		19.3	30.6	219	98.3	14.3
	6		17.5	30.8	206	99.2	13.5
Mean			18.4	31.2	216.8	99.2	14.1
SD			0.9	0.5	7.6	0.6	0.6

Table C-51. Test 53 monitor gauge (chief of section) pressure-time values for sheep numbers 624 and 625.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
12/19/95	1	1814	14.5	22.5	123	100.0	10.8
	2		14.9	32.5	175	98.5	11.0
	3		13.6	32.8	175	93.5	11.0
	4		16.3	32.3	177	98.3	12.9
	5		15.8	32.3	187	95.5	13.6
	6		15.6	33.1	174	96.4	11.6
	7		16.5	31.8	187	91.1	13.2
	8		16.5	32.7	186	100.0	12.6
	9		17.3	31.3	179	97.5	11.6
	10						
	11		15.9	32.2	175	98.2	12.2
	12		14.7	32.2	188	99.9	12.1
	13		15.3	31.7	176	97.2	11.3
	14						
	15		17.2			100.0	13.2
	16		15.5	31.6	177	99.9	11.5
	17		15.0	31.7	174	96.9	11.2
	18		16.8	31.6	173	96.9	12.5
	19		19.1	31.6	198		14.8
	20		18.6	31.2	184		12.5
	21		16.5	32.7	192	98.1	13.3
	22		16.2	22.4	128	90.7	11.8
	23		17.4	31.5	188	98.7	13.2
	24		14.7	32.7	170	99.3	12.2
	25		15.4	29.9	165	98.2	11.6
	26		17.2	32.1	173	93.9	11.3
	27		17.9	31.5	189	99.9	13.4
	28		18.3	31.3	189	98.5	14.7
	29		17.8	31.5	192	86.5	13.6
	30		15.2	31.6	180	99.8	12.9
	31		13.8	31.1	176	97.1	11.5
	32		15.6	31.3	174	100.0	11.2
	33		16.9	30.4	168	98.6	12.2
	34		15.6	31.8	178	97.7	11.5
	35		18.3	31.3	181	99.2	13.3
	36		16.2	31.1	168	100.0	11.1
	37		14.5	31.4	180	98.3	11.6
	38		16.3	22.6	130	96.9	12.3
	39		16.4	31.5	173	82.7	11.2
	40		16.1	31.5	178	91.2	12.3
	41		17.0	31.7	181	98.5	13.4
	42		15.1	21.8	132	100.0	11.8
	43		13.6	27.6	139	97.6	11.3
	44		14.5	31.2	178	97.1	11.6

Table C-51. Test 53 monitor gauge (chief of section) pressure-time values for sheep numbers 624 and 625.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		15.1	31.3	166	96.4	12.0
	46		16.2	30.9	173	96.1	12.2
	47		15.3	31.3	179	92.6	11.8
	48		15.2	22.2	121	97.3	10.8
	49		15.3	31.0	179	96.2	11.6
	50		14.3	30.5	170	100.0	11.5
	51		15.8	31.7	176	98.2	12.1
	52		15.5	31.2	180	99.7	12.0
	53		15.7	28.4	163	99.3	12.1
	54		14.7	31.4	171	98.5	11.5
	55		15.0	32.0	176	98.6	12.0
	56		15.6	21.9	125	100.0	11.3
	57		16.2	31.8	180	96.0	12.2
	58		19.9	31.5	185	99.6	14.0
	59		15.5	30.9	175	99.7	11.6
	60		17.2			97.6	12.7
	61		16.4	31.9	185	85.2	13.3
	62		15.6	22.2	134	100.0	12.8
	63		16.2	31.1	185	99.0	12.2
	64		15.4	31.5	173		11.8
	65		15.4	21.7	124	94.7	11.2
	66						
	67		15.6	31.5	174	98.5	11.6
	68		16.2	22.2	129	97.3	12.0
	69		17.1	31.3	184	98.9	13.2
	70		16.1	31.4	181	99.7	13.0
	71		15.5	31.4	176	100.0	12.1
	72		15.4	31.7	180	96.2	12.0
	73		14.8	20.0	113	98.1	11.3
	74		18.4	21.6	129	96.4	14.3
	75		17.1	31.6	185	99.9	13.1
	76		16.4	31.1	164	95.9	11.5
	77		15.1	32.6	173	96.0	11.3
	78		15.9	31.4	171	98.3	11.4
	79		14.0	27.4	136	98.5	11.2
	80		17.5	31.4	186	99.9	12.6
	81		15.1	22.4	130	95.9	11.6
	82		19.3	31.4	192	99.8	15.6
	83		14.2	22.1	122	93.7	11.0
	84		15.4	31.4	183	95.5	12.4
	85		18.0	31.1	174	99.4	13.1
	86		16.2	31.5	182	97.9	11.6
	87		15.2	31.3	169	96.1	11.5
	88		15.3	31.2	177	97.6	11.3

Table C-51. Test 53 monitor gauge (chief of section) pressure-time values for sheep numbers 624 and 625.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		18.0	31.0	186	99.9	12.8
	90		15.2	31.5	170	95.8	11.5
	91		16.3	31.3	186	95.2	13.0
	92		14.7	22.1	128		11.2
	93		15.3	22.5	127	99.8	11.5
	94		15.9	32.0	175	98.0	12.3
	95		14.2	31.5	175	97.3	11.3
	96		17.6	21.8	128	97.7	12.5
	97		15.5	31.4	174	96.9	12.3
	98		14.2	31.5	174	95.8	11.8
	99		17.1	31.1	189	100.0	13.7
	100		18.0	31.7	190	98.3	13.2
Mean			16.0	29.8	168.9	97.3	12.2
SD			1.3	3.6	21.2	3.1	1.0

Table C-52. Test 54 monitor gauge (chief of section) pressure-time values for sheep numbers 628 and 629.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
1/9/96	1	1814	17.2	31.2	185	95.9	13.8
	2		16.6			99.6	12.7
	3		14.8	31.8	185	98.7	12.0
	4		14.6	32.4	167	98.4	12.4
	5		16.0	32.3	173	98.0	12.0
	6		18.0	32.1	186	100.0	15.0
	7		14.5	31.2	164	95.1	11.4
	8		15.9	28.7	172	97.0	12.4
	9		15.0	31.5	179	100.0	12.5
	10		15.0	31.2	172	100.0	11.5
	11		15.9	31.2	171	96.0	11.7
	12		17.3	28.0	176	99.4	13.3
	13		21.8	28.5	182	98.0	16.4
	14		17.9	28.2	176	97.7	14.2
	15		16.8	30.1	174	99.2	13.2
	16		14.6	31.9	180	99.8	11.6
	17		15.3	31.2	181	98.5	11.8
	18		15.4	32.4	181	91.1	12.4
	19		15.8	22.4	125	98.7	11.4
	20		19.2	31.2	194	99.6	14.5
	21		16.4	31.5	168	99.5	11.2
	22		14.3	30.9	166	95.5	11.0
	23		15.4	22.3	130	99.7	12.1
	24		18.7	30.8	178	97.3	13.4
	25		15.0	27.1	164	100.0	12.1
	26		15.4	20.3	123	198.0	11.6
	27		18.6	18.7	120	97.8	12.5
	28		16.7	20.2	123	99.9	11.9
	29		19.1	29.5	195		15.6
	30		16.0	18.2	119	98.4	12.1
	31		21.4	30.9	188		15.4
	32		14.5	31.6	173	96.4	12.1
	33		15.4	27.9	177	99.6	12.6
	34		14.6	20.4	123	99.5	11.2
	35		14.4	22.2	125	99.5	11.1
	36		18.1	31.6	185	99.6	13.8
	37		16.6	31.8	183		13.3
	38		14.7	27.5	148	94.3	11.4
	39		15.2	21.9	129	97.2	11.5
	40		15.5	31.4	170	95.7	11.5
	41		16.8	31.9	181	95.6	12.1
	42		16.1	29.4	171	97.0	12.0
	43		16.6	31.2	184	99.2	12.8
	44		16.8	32.1	176	99.5	12.4

Table C-52. Test 54 monitor gauge (chief of section) pressure-time values for sheep numbers 628 and 629.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		15.9	30.1	185	100.0	13.2
	46		21.0	25.4	172	99.3	15.5
	47		14.8	30.9	179	99.2	11.5
	48		15.5	31.9	172	94.1	11.5
	49		16.0	31.2	172	100.0	12.7
	50		16.5	30.8	181	99.5	12.6
	51		15.5	31.0	176	99.9	11.9
	52		16.6	21.4	130	99.8	12.6
	53		15.0	30.7	170	98.8	10.9
	54		15.2			99.8	11.7
	55		16.3	30.8	188	99.8	12.3
	56		19.0	31.4	181	97.1	13.6
	57		18.2	28.0	172	98.9	13.3
	58		16.3	22.1	127	99.1	11.3
	59		15.6	22.2	124	95.7	11.3
	60		16.0	28.9	154	97.4	11.8
	61		15.2	23.1	125	99.3	10.8
	62		17.9	30.3	176	99.3	13.6
	63		16.5	26.8	147	96.8	11.6
	64		15.3	31.3	173	99.6	12.2
	65		16.4	30.6	180	99.7	12.2
	66		15.0	31.6	165	99.1	12.2
	67		14.4	22.0	125	88.3	11.2
	68		16.7	29.8	174	99.1	12.2
	69		14.9	31.0	174	100.0	11.7
	70		15.5	31.4	176	100.0	12.1
	71		14.1	31.0	171	100.0	11.7
	72		14.2	22.1	121	94.1	11.0
	73		17.8	30.6	190	98.6	14.2
	74		16.7	31.6	173	99.8	12.5
	75		16.5	31.1	186	99.7	11.6
	76		17.6	30.8	180	94.9	12.4
	77		16.0	30.6	184	94.7	12.0
	78		18.0	31.3	190	94.8	14.0
	79		17.1	31.3	166	99.9	11.5
	80		21.0	29.8	185	99.6	14.7
	81		16.7	30.6	174	100.0	11.8
	82		15.2	31.0	175	97.0	11.8
	83		16.4	31.0	173	99.2	12.4
	84		15.7	32.0	185	94.6	12.8
	85		17.1	30.3	185	99.3	13.1
	86		16.3	30.7	176	99.0	12.3
	87		18.9	30.4	177	99.3	12.8
	88		14.9	31.0	166	95.7	11.2

Table C-52. Test 54 monitor gauge (chief of section) pressure-time values for sheep numbers 628 and 629.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		19.0	31.0	181	99.8	14.0
	90		15.4	22.0	127	99.5	11.9
	91		17.7	31.4	180	99.8	12.7
	92		16.0	30.5	177	98.6	11.7
	93		17.2	18.8	121	99.7	12.8
	94		14.3	29.0	158	100.0*	11.3
	95		18.6	29.8	191		14.3
	96		15.7	22.1	131	100.0	12.2
	97		15.8	21.9	126	97.6	12.0
	98		17.6	28.0	161	97.4	12.2
	99		15.7	20.1	122	99.3	12.1
	100		16.7	31.3	177	99.8	12.1
Mean			16.4	28.6	165.6	99.3	12.4
SD			1.6	4.0	22.4	10.4	1.1

Table C-53. Test 55 monitor gauge (chief of section) pressure-time values for sheep numbers 630 and 631.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
1/16/96	1	1814	20.9	30.6	199	99.8	15.2
	2		14.7	29.4	162	99.0	12.1
	3		19.5	31.6	191	96.3	14.9
	4		16.0	32.0	167	94.6	12.7
	5		17.4	32.3	187	98.6	13.7
	6		15.3	32.4	183	97.8	12.6
	7		14.7	31.9	174	99.3	12.1
	8		14.7	32.0	177	99.6	11.8
	9		14.9	32.6	163	96.1	11.8
	10		15.6	22.2	131	99.9	12.2
	11		19.7	31.1	200	99.4	15.6
	12		15.8	30.8	175	99.9	13.1
	13		16.1	31.9	178		12.4
	14		15.5	31.7	172	100.0	12.8
	15		16.4	31.8	185	100.0	13.4
	16		16.7	31.4	179	95.5	12.6
	17		13.7	32.0	177	100.0	11.4
	18		19.0	31.5	192	99.2	14.2
	19		14.8	32.1	186	99.6	11.9
	20		20.4	31.1	180	97.9	14.3
	21		16.9	31.7	181	97.4	13.8
	22		15.7	31.7	169	99.9	12.2
	23		13.1	32.0	166	99.7	10.5
	24		14.4	31.2	179	97.0	11.2
	25		17.2			99.9	11.4
	26		16.0	28.5	165	100.0	12.3
	27		15.2	32.2	173	99.4	11.4
	28		16.0	31.4	172	99.6	12.6
	29		14.9	31.7	169	99.4	11.8
	30		15.3	31.9	175	99.2	11.8
	31		15.5	31.4	178	99.6	12.0
	32		17.6	31.8	181	99.9	13.4
	33		20.0	31.5	202	98.9	16.7
	34		16.8	32.3	187	99.0	13.2
	35		14.9	22.1	126	99.5	12.0
	36		17.3	31.6	179	99.9	13.0
	37		15.1	31.7	175	95.4	12.0
	38		14.7	30.6	185	97.9	12.5
	39		15.5	31.7	176	98.6	12.4
	40		15.6	31.8	167	99.8	10.9
	41		14.8	30.9	174	99.6	11.5
	42		15.4	30.8	176	98.7	12.8
	43		14.5	22.2	128	99.7	11.8
	44		19.6	27.2	189	99.9	15.1

Table C-53. Test 55 monitor gauge (chief of section) pressure-time values for sheep numbers 630 and 631.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		17.8	31.1	180	97.5	13.4
	46		19.6	31.6	187	98.9	15.0
	47		20.2	31.2	187	100.0	15.4
	48		15.3	31.4	173	100.0	12.0
	49		15.6	31.5	178	98.8	12.2
	50		18.0	27.2	182		14.2
	51		17.3			99.9	12.8
	52		15.7	22.0	128	96.9	12.0
	53						
	54		13.5	22.0	120	99.5	11.1
	55		16.8	31.4	178	93.9	12.6
	56		16.4	31.7	171	93.5	11.8
	57		16.4	30.5	168	98.6	11.8
	58		16.2	31.4	189	99.6	12.2
	59		16.1	31.7	173	94.5	11.4
	60		14.2	31.6	179	99.8	11.2
	61		16.3	31.6	182	94.8	12.9
	62		14.6	29.5	170	98.5	11.2
	63		14.6			99.9	11.3
	64		15.7	22.1	135	99.0	11.9
	65		16.2	21.9	129	99.0	12.2
	66		16.7	31.5	171	99.2	12.2
	67		15.1	31.1	177		12.4
	68		15.0	31.3	175	99.1	11.8
	69		14.3	22.0	123	98.6	11.4
	70		16.8	31.4	183	99.9	11.6
	71		16.4	21.7	129	98.9	11.7
	72		16.1	31.6	177	95.0	13.0
	73		15.3			99.0	12.0
	74		18.1	30.7	184	98.2	14.2
	75		16.2	31.3	172	88.9	11.8
	76		19.9	28.8	180	100.0	15.0
	77		14.8	31.3	177	99.4	11.5
	78		16.8	31.9	189	99.6	12.4
	79		15.5	31.3	169	99.6	11.2
	80		14.9	22.1	126	99.0	11.2
	81		15.8	30.8	176	97.0	12.1
	82		16.5	30.8	181	98.8	12.6
	83		15.9	31.4	178	98.2	12.4
	84		15.4	31.2	162	94.3	11.0
	85		16.3	30.5	186	99.6	12.0
	86		15.1	21.8	124	97.9	11.3
	87		15.5	20.5	124	99.0	12.4
	88		16.1	30.8	167	99.7	11.7

Table C-53. Test 55 monitor gauge (chief of section) pressure-time values for sheep numbers 630 and 631.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		16.0	31.1	182	94.0	13.2
	90		15.3	31.4	171	99.6	12.0
	91		15.6			99.8	12.1
	92		20.2	31.2	187		14.5
	93		17.0	31.7	175	98.5	13.1
	94		15.1	31.7	172	99.5	11.4
	95		16.4	31.2	178	93.3	11.5
	96		15.7	21.9	126	99.4	11.5
	97		17.5	28.9	170	99.8	13.2
	98		15.0	32.0	179	96.5	11.7
	99		18.4	30.6	173	97.8	12.5
	100		17.6	31.2	182	99.7	13.6
Mean			16.2	29.9	170.9	98.4	12.5
SD			1.6	3.4	19.4	2.0	1.2

Table C-54. Test 56 monitor gauge (chief of section) pressure-time values for sheep numbers 632 and 633.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
2/1/96	1	1814	15.8	32.1	191	98.8	13.1
	2		18.1	31.9	190	99.8	13.9
	3		14.5	22.4	132	97.9	12.2
	4		14.2	32.1	183	99.2	11.9
	5		15.4	32.2	179	99.1	12.0
	6		16.6	31.6	168	98.5	11.6
	7		15.2	32.1	179	99.4	12.5
	8		14.2	31.7	180	99.1	12.0
	9		18.9	31.0	192	99.4	15.1
	10		15.8	32.2	181	99.2	13.1
	11		15.8	32.4	181	96.4	12.4
	12		15.9	31.9	188	100.0	12.9
	13		18.6	31.8	191	98.8	14.0
	14		15.1	31.8	177	97.5	11.6
	15		15.2	32.0	172	99.6	11.8
	16		16.8	31.9	187	98.8	12.8
	17		15.4	31.3	181	100.0	12.6
	18		14.2	32.2	158	99.7	11.4
	19		14.4	32.1	174	96.7	11.7
	20		14.9	22.5	124	97.8	11.1
	21		15.3	31.9	178	95.2	11.3
	22		15.8	32.2	175	98.1	11.5
	23		15.6	31.9	173	98.7	11.7
	24		15.2	31.3	185	100.0	12.6
	25		16.4	31.4	199	94.4	13.0
	26		15.6	31.7	187	98.6	12.6
	27		15.4	32.6	171	88.7	11.7
	28		16.2	31.7	168	99.9	11.3
	29		15.1	31.2	191	99.5	12.8
	30		17.8	31.6	195	99.3	13.7
	31		19.4	31.4	194	99.8	14.7
	32		14.3	32.1	167	94.7	11.4
	33		15.6	32.1	178	99.4	12.4
	34		14.1	22.6	119	96.2	11.1
	35		14.3	31.2	177	99.7	12.1
	36		17.6	31.3	177	97.6	12.0
	37		17.9	31.9	185	99.8	12.4
	38		15.4	22.5	124	95.9	10.9
	39		16.2	22.2	130	94.1	12.1
	40		14.5	31.4	164	99.9	11.2
	41		15.4	31.5	179	99.8	11.3
	42		14.9	32.0	173	95.4	11.1
	43		15.0	31.5	178	99.8	11.6
	44		14.5	31.6	176	94.9	11.1

Table C-54. Test 56 monitor gauge (chief of section) pressure-time values for sheep numbers 632 and 633.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		17.1	31.8	191	99.8	13.2
	46		14.7	31.9	174	93.7	11.2
	47		15.8	31.5	176	93.7	11.9
	48		18.0	31.4	199		14.7
	49		15.1	31.2	179	99.7	12.1
	50		16.4	31.8	177	99.9	12.8
	51		15.9	31.1	187	100.0	12.2
	52		13.8	30.1	173	99.0	11.0
	53		15.5	31.1	181	99.2	11.9
	54		13.6	32.5	157	93.8	10.8
	55		15.7	31.9	194	94.2	12.7
	56		13.8	31.1	175	100.0	11.1
	57		18.9	32.3	182	99.1	12.1
	58		14.7	31.4	172	99.4	11.2
	59		15.2	32.0	181	99.2	11.6
	60		14.2	32.2	170	93.8	11.1
	61		16.2	31.8	182	99.1	12.8
	62		15.3	28.1	175	99.5	11.9
	63		14.1	32.2	176	98.2	11.2
	64		16.5	31.3	190	99.5	13.6
	65		15.7	31.7	179	96.4	12.4
	66		14.1	31.9	170	98.4	11.6
	67		14.7	21.7	123	99.4	10.8
	68		14.8	31.5	188	98.0	12.7
	69		14.6	31.6	175	95.8	12.1
	70		13.4	27.4	146	94.6	10.8
	71		17.6	31.9	201	95.9	13.0
	72		14.5	31.2	169	98.5	11.8
	73		14.7	21.6	126	97.5	11.3
	74		14.3	32.2	180	96.9	11.7
	75		15.2	31.4	170	94.2	11.6
	76		14.7	31.2	173	97.3	12.4
	77		14.4	31.1	184	93.0	11.6
	78		17.5	31.0	193	98.8	13.5
	79		14.6	22.5	123	98.8	11.5
	80		15.6	31.8	191	100.0	13.1
	81		15.4	32.0	181	99.4	11.7
	82		15.6	31.1	184	97.6	13.4
	83		16.2	31.8	177	98.6	12.1
	84		16.3	30.8	186	99.8	13.0
	85		14.3	32.2	172	100.0	10.7
	86		20.1	31.3	194	98.6	14.8
	87		17.7	31.4	184	95.5	13.8
	88		13.4	31.7	174	98.7	11.0

Table C-54. Test 56 monitor gauge (chief of section) pressure-time values for sheep numbers 632 and 633.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		14.7	31.3	184	92.4	11.9
	90		15.0	31.5	173	98.0	11.4
	91		14.2	22.1	126	99.8	11.2
	92		13.5	31.1	166	93.0	10.5
	93		14.6	30.9	178	96.5	11.4
	94		14.8	32.0	171	99.6	11.1
	95		12.9	32.3	161	99.1	10.6
	96		14.9	22.0	123	98.1	11.2
	97		14.7	32.1	181	98.8	11.8
	98		14.0	31.6	181	98.5	11.2
	99		16.0	31.6	185	99.6	13.4
	100		16.0	32.1	170	91.0	10.9
Mean			15.5	30.7	173.8	97.8	12.1
SD			1.4	2.9	18.8	2.4	1.0

Table C-55. Test 57 monitor gauge (chief of section) pressure-time values for sheep numbers 634 and 635.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
2/6/96	1	1814	16.4	32.1	185	98.7	13.4
	2		14.7	31.4	180	98.8	11.6
	3		16.1	31.6	184	97.7	13.5
	4		14.9	31.2	171	97.9	11.9
	5		16.8	31.2	188	97.9	12.2
	6		14.1	31.8	179	99.2	11.3
	7		16.6	31.6	186	98.1	13.8
	8		14.8	28.2	183	99.3	12.3
	9		15.3	31.8	180	99.7	12.5
	10		16.1	29.8	180	99.4	12.8
	11		18.3	31.5	176	95.0	13.9
	12		17.1	31.6	177	99.4	12.3
	13		15.5	27.2	145	98.4	11.6
	14		15.8	31.6	172	99.8	11.6
	15		17.2	27.6	145	95.4	12.1
	16		16.5	31.9	170	99.6	12.4
	17		17.6	31.1	186	100.0	13.9
	18		16.3	22.1	123	98.6	12.2
	19		16.4	31.0	181	98.9	12.3
	20		17.6	31.5	174	98.4	12.6
	21						
	22		15.4	31.2	176	98.3	11.8
	23		15.2	31.9	179	95.2	12.2
	24		14.3	22.6	125	93.3	11.4
	25		16.0	31.6	176	98.0	12.3
	26		14.6	31.3	171	99.3	11.2
	27		15.1	28.4	168	95.6	11.9
	28		17.6	28.1	154	99.7	11.6
	29		15.4	31.2	172	98.3	12.2
	30		15.4	31.4	186	98.4	11.2
	31		16.3	31.2	170	99.3	11.4
	32		15.6	31.9	172	95.1	11.3
	33		15.4	31.4	176	94.7	12.4
	34		15.0	31.4	179	99.8	12.1
	35		13.5	32.3	167	96.2	11.2
	36		15.3	31.5	171	98.9	12.0
	37		16.4	31.3	179	99.1	11.5
	38		17.1	31.4	172	96.9	13.4
	39		15.5	31.8	172	97.4	12.5
	40		14.8	31.6	169	100.0	11.4
	41		15.8	31.2	174	95.2	11.7
	42		14.1	31.2	180	99.4	12.0
	43		16.7	30.7	177	97.0	11.8
	44		17.0	31.1	177	96.5	14.5

Table C-55. Test 57 monitor gauge (chief of section) pressure-time values for sheep numbers 634 and 635.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		15.7	31.4	183	99.5	12.3
	46		16.1	31.4	177	97.6	12.3
	47		15.0	30.9	181	98.9	12.2
	48		14.5	31.1	170	99.9	10.7
	49		15.8	31.4	171	99.1	11.5
	50		15.4	27.4	145	97.9	11.6
	51		16.5	30.2	186	99.2	12.9
	52		13.9	31.4	166	97.6	11.0
	53		15.7	30.9	164	98.0	11.1
	54		15.6	31.3	180	97.4	12.3
	55		15.0	22.4	130	99.9	11.6
	56		15.0	31.2	174	98.7	11.5
	57		15.2	30.9	174	97.1	12.0
	58		15.5	31.2	181	99.3	12.8
	59		13.6	22.6	123	98.4	10.8
	60		15.4	27.7	176	99.4	12.3
	61		17.0	31.1	180	98.8	13.3
	62		16.8	31.3	192	98.2	13.3
	63		18.1	27.6	184	98.4	14.7
	64		15.1	31.2	177	100.0	12.1
	65		13.2	31.7	164	92.6	10.9
	66		17.8	30.7	177	98.7	13.2
	67		17.6	30.6	191	99.8	14.2
	68		16.3	28.9	178	97.6	13.1
	69		14.0	27.9	167	97.9	11.2
	70		15.9	28.0	178	99.6	12.4
	71		15.5	31.1	173	100.0	11.7
	72		16.8	31.0	185	98.5	14.8
	73		18.9	27.6	177	96.9	14.7
	74		16.0	31.0	181	97.2	12.5
	75		16.1	31.2	175	98.9	11.8
	76		14.6	31.6	173	99.8	11.4
	77		17.7	31.0	174	96.6	11.7
	78		15.0	31.4	169	94.7	11.0
	79		15.5	31.1	173	98.7	11.4
	80		15.6	31.4	172	98.3	12.0
	81		15.4	21.9	124	97.7	11.0
	82		15.6	21.8	129	99.0	12.2
	83		14.6	30.8	174	96.0	11.0
	84		14.3	22.5	124	98.5	11.3
	85		15.2	31.0	174	98.8	11.4
	86		12.9	31.2	163	92.8	10.7
	87		15.0	27.6	166	99.8	11.8
	88		17.1	31.2	179	99.0	12.4

Table C-55. Test 57 monitor gauge (chief of section) pressure-time values for sheep numbers 634 and 635.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		15.0	30.7	179	98.4	12.3
	90		15.0	31.3	177	99.5	11.6
	91		16.1	22.1	129	95.8	11.6
	92		17.3	31.2	171	92.5	11.4
	93		16.0	31.1	180	96.5	13.4
	94		14.8	31.3	173	96.2	11.8
	95		14.8	31.1	177	98.6	11.7
	96		14.9	30.8	176	98.8	12.0
	97		18.2	27.0	176	99.0	14.0
	98		18.1	27.6	182	98.1	14.8
	99		14.7	30.9	170	98.7	11.2
	100		15.7	30.9	178	98.4	11.5
Mean			15.8	30.0	171.0	98.0	12.2
SD			1.2	2.7	15.7	1.7	1.0

Table C-56. Test 58 monitor gauge (chief of section) pressure-time values for sheep numbers 636and 637.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
2/13/96	1	1814	15.3	31.9	174	100.0	11.8
	2		15.0	31.3	180	100.0	12.1
	3		14.3	31.7	180	99.4	12.0
	4		14.7	27.6	153	99.7	11.6
	5		14.8	31.9	168	99.0	11.5
	6		16.3	31.7	181	90.8	12.9
	7		14.6	31.8	181		11.6
	8		16.2	31.2	168	96.1	12.2
	9		19.6	27.8	185	99.3	15.6
	10		17.8	31.4	189	99.9	14.8
	11		17.4	31.4	185	100.0	13.7
	12		16.0	29.7	171	93.3	11.7
	13		18.0	30.8	183	96.6	14.3
	14		19.0	31.1	193	98.1	15.9
	15		14.8	31.9	172	99.4	12.0
	16		19.1	31.1	192	99.9	15.8
	17		16.1	31.8	183	99.1	13.5
	18		17.1	31.2	179	98.1	13.3
	19		14.6	31.9	174	99.9	11.2
	20		16.3	31.8	189	99.8	13.8
	21		16.3	31.6	183		11.8
	22		17.8	31.0	180	99.7	13.3
	23		16.5	31.4	171	100.0	12.0
	24		19.4	31.6	190	99.6	14.6
	25		16.0	31.9	175	100.0	11.8
	26		15.9	31.5	181	96.0	12.1
	27		14.7	31.1	176	99.2	11.2
	28		15.9	30.7	181	94.5	12.3
	29		15.9	31.4	178	99.4	13.0
	30		14.2	31.6	169	99.9	10.5
	31		14.5	31.8	169	99.8	11.1
	32		16.0	30.8	181	100.0	12.0
	33		14.6	31.7	188	99.7	12.2
	34		15.6	31.7	174	99.4	11.3
	35		15.1	31.3	184		12.3
	36		14.9	31.5	180	98.0	12.6
	37		15.7	30.9	177	99.9	12.3
	38		15.7	31.4	170	100.0	11.9
	39		14.9	31.8	179	99.4	11.1
	40		15.5	30.8	175	93.1	12.7
	41		16.6	31.4	175	99.3	12.3
	42		14.9	31.4	167	99.3	11.4
	43		16.0	31.6	185	99.2	12.7
	44		16.8	31.2	176	99.2	12.2

Table C-56. Test 58 monitor gauge (chief of section) pressure-time values for sheep numbers 636and 637.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		15.4	31.3	177	94.5	12.2
	46		18.4	31.4	183	99.3	14.4
	47		14.7	28.6	165	98.0	12.4
	48		14.7	28.6	151	99.8	10.8
	49		16.3	31.6	167	96.3	12.1
	50		18.0	31.4	185	100.0	13.8
	51		15.8	31.7	184	99.7	12.4
	52		16.6	31.5	182	99.9	12.4
	53		16.2	31.5	183	98.8	12.9
	54		14.8	31.0	177	99.4	12.2
	55		16.1	31.6	179	98.3	12.3
	56		15.2	31.3	171	98.4	12.1
	57		15.2	22.8	128	99.9	12.0
	58		16.2	31.7	183	99.8	12.8
	59		16.3	31.2	170	95.2	11.9
	60		14.0	31.0	167	98.5	11.2
	61		15.2	31.4	178	100.0	11.5
	62		16.8	31.2	185	99.7	12.1
	63		16.1	30.8	182	98.2	13.1
	64		14.5			94.6	10.8
	65		16.0	32.0	169	99.3	10.9
	66		14.4	31.1	170	98.8	11.2
	67		15.6	31.5	175	99.2	11.9
	68		14.5	31.6	169	93.5	12.0
	69		16.5	28.3	173	99.7	12.7
	70		13.9	31.5	167	99.2	11.3
	71		13.9	22.4	121	98.9	11.0
	72		14.1	31.2	173	99.4	11.2
	73		20.7	29.2	191	95.9	15.1
	74		16.0	30.4	173	99.2	11.6
	75		16.5	31.7	171	99.8	12.7
	76		15.2	31.3	172	99.1	11.2
	77		14.9	31.6	168	92.7	12.1
	78		16.1	31.6	169	98.4	12.4
	79		14.9	31.4	173	99.5	11.0
	80		14.4	31.1	160	98.9	10.6
	81		16.6	31.4	170		12.3
	82		18.2	31.1	182	98.0	14.0
	83		15.1	31.1	185	97.0	11.6
	84		16.6	31.0	181	100.0	12.4
	85		17.0	31.5	174	98.3	13.0
	86		14.8	22.1	126	100.0	12.2
	87		13.5	31.0	167	100.0	10.6
	88		19.3	30.5	198		15.6

Table C-56. Test 58 monitor gauge (chief of section) pressure-time values for sheep numbers 636and 637.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		16.0	21.8	126	97.9	11.8
	90		15.8	31.1	174	99.7	11.9
	91		16.8	30.5	180	99.3	11.9
	92		14.3	31.3	163	94.6	11.0
	93		14.5	22.4	120	99.4	11.4
	94		19.3	27.6	170	95.3	14.0
	95		14.8	22.0	126		11.8
	96		14.1	30.9	167	99.2	11.2
	97		17.9	31.2	172	99.7	11.6
	98		15.8	31.5	165	93.9	11.7
	99		16.7	30.7	191	98.6	13.7
	100		14.6	21.7	132	89.6	12.2
Mean			15.9	30.5	172.8	98.3	12.3
SD			1.5	2.5	15.5	2.2	1.2

Table C-57. Test 59 monitor gauge (chief of section) pressure-time values for sheep numbers 638 and 639.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
2/20/96	1	1814	13.7	30.8	164	96.8	11.3
	2		13.6	31.9	170	99.5	11.1
	3		14.6	31.7	170	95.8	12.7
	4		15.3	32.0	183	100.0	11.6
	5		16.9	31.5	176	98.7	13.1
	6		15.1	32.0	165	98.0	12.0
	7		16.0	31.5	182	99.7	13.5
	8		15.7	31.5	178	96.9	13.6
	9		13.9	31.8	177	97.6	11.3
	10		17.3	31.4	181	99.4	13.9
	11		16.3	31.6	185	99.5	13.5
	12		14.6	31.2	170	99.7	11.9
	13		15.4	31.8	182	99.6	12.4
	14		16.3	31.0	180		12.1
	15		15.4	19.7		92.1	11.2
	16		16.6	30.6	171	96.3	12.7
	17		13.6	31.9	164	97.3	11.2
	18		17.6	31.0	186	98.4	15.0
	19		15.4	31.4	183	98.9	12.6
	20		16.6	31.5	175	97.0	13.4
	21		16.4	31.6	177	99.9	13.2
	22		14.2	31.5	167	99.5	11.1
	23		18.5	31.0	181	99.5	13.2
	24		14.8	31.7	171	97.6	11.7
	25		16.5	31.5	178	94.1	13.0
	26		17.2	31.6	175	98.3	12.8
	27		17.5	31.5	180	98.8	13.6
	28		15.3	31.1	172	98.3	12.0
	29		18.2	31.3	181	99.9	14.2
	30		14.8	31.3	172	99.0	12.1
	31		15.3	31.5	177	98.7	11.7
	32		18.0	31.5	183	98.1	13.3
	33		16.1	31.7	176	99.8	12.9
	34		14.6	31.3	174	99.6	11.4
	35		18.0	31.5	192	99.3	14.0
	36		17.1	31.5	185	99.3	14.6
	37		15.1	31.4	176	92.3	12.0
	38		18.9	31.2	190	97.7	14.8
	39		15.5	25.0	131	96.0	10.9
	40		14.1	31.8	174	99.4	11.8
	41		15.7	30.7	179	98.6	12.9
	42		14.1	22.6	122	99.7	10.8
	43		18.1	31.4	187	99.1	14.2
	44		13.8	31.3	171	96.0	11.4

Table C-57. Test 59 monitor gauge (chief of section) pressure-time values for sheep numbers 638 and 639.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		17.2	30.7	173	99.5	12.6
	46		15.6	31.5	182	99.4	12.3
	47		18.8	31.1	182	85.0	14.4
	48		15.8	31.5	176	98.2	13.6
	49		14.4	31.0	180	99.2	11.5
	50		17.3	31.3	175	99.9	14.0
	51		16.3	30.8	178	98.5	12.5
	52		14.8	32.4	167	91.1	11.3
	53		12.9	32.0	165	99.4	11.1
	54		13.6	31.6	165	98.9	10.3
	55		15.7	31.4	170	94.4	12.0
	56		14.7	31.3	174	98.0	11.8
	57		15.3	31.5	176	97.2	12.6
	58		13.8	31.5	181	99.1	11.7
	59		15.6	31.0	181	98.9	11.6
	60		15.1	31.4	174		11.4
	61		17.8	31.0	177	80.5	13.1
	62		12.7			99.8	10.6
	63		14.8	30.9	172	99.7	11.8
	64		14.2	31.2	169	98.9	11.2
	65		14.4	31.4	179	99.7	11.8
	66		15.0	31.0	172	98.5	12.2
	67		17.0	30.4	177	94.4	13.3
	68		15.5	31.3	166	95.1	11.2
	69		16.7	31.1	177	98.5	12.9
	70		16.5	31.3	172	99.0	11.9
	71		16.3	31.3	175	98.1	13.1
	72						
	73		14.7			99.2	11.6
	74						
	75		15.9	30.5	179	97.7	13.2
	76		17.2	31.0	184	98.1	14.1
	77		18.2	31.1	185	99.0	14.4
	78		14.8	30.8	171	98.6	11.5
	79		15.7	31.1	168	93.8	12.1
	80		20.0	30.8	196	98.6	15.5
	81		15.0	31.6	179	100.0	12.3
	82		14.8	30.7	183	99.8	11.9
	83		17.1	30.4	185	97.9	13.3
	84		15.4	30.6	169	98.2	11.4
	85		17.5	30.9	180	97.3	13.3
	86		17.8	31.0	179	98.2	13.3
	87		15.9	31.2	192	97.7	12.4
	88		17.4	31.3	186	97.9	14.0

Table C-57. Test 59 monitor gauge (chief of section) pressure-time values for sheep numbers 638 and 639.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		19.1	31.2	185	99.9	13.3
	90		15.6	31.6	173	90.5	11.7
	91		16.1	31.1	166	99.0	12.1
	92		18.4	30.3	188	97.7	14.8
	93		14.5	31.5	168	99.0	11.0
	94		15.2	31.4	176	97.9	11.6
	95		15.2	31.4	170	99.0	11.8
	96		18.1	30.3	181	98.7	14.6
	97		17.0	31.6	180	98.9	12.3
	98		14.9	31.2	179	90.2	12.3
	99		14.1	31.5	181	99.5	11.3
	100		15.5	31.8	186	97.5	12.6
Mean			15.9	31.0	176.0	97.7	12.5
SD			1.5	1.6	10.0	3.0	1.1

Table C-58. Test 60 monitor gauge (chief of section) pressure-time values for sheep numbers 640 and 641.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
2/29/96	1	1814	18.4	33.0	188	99.9	11.6
	2		16.3	32.2	180	99.9	13.7
	3		16.2	28.9	172	97.0	11.6
	4		14.5	32.0	187	99.8	11.8
	5		19.0	32.9	187	99.0	14.9
	6		16.0	32.3	176	100.0	12.4
	7		17.4	28.4	189	91.2	14.4
	8		13.7	32.6	171	99.8	11.1
	9		15.9	31.9	188	99.6	13.2
	10		20.0	31.9	190	99.8	14.2
	11		16.8	31.8	175	100.0	13.2
	12		19.3	31.7	194	91.4	15.2
	13		16.9	32.4	185	97.4	13.2
	14		15.0	22.3	127	99.3	11.7
	15		14.7	27.7	159	98.8	12.5
	16		17.2	32.2	171	97.0	12.8
	17		15.0	31.8	188	99.3	12.1
	18		16.8	31.8	189	99.3	13.4
	19		16.8	32.1	183	98.9	13.6
	20		13.5	22.6	123	98.5	11.0
	21		16.1	31.8	183	99.8	12.5
	22		15.1	31.3	179	99.0	11.9
	23		17.4	31.7	180	98.9	13.0
	24		17.4	29.6	179	98.7	12.5
	25		16.5	30.2	181	99.3	12.2
	26		17.9	31.7	191	87.7	13.5
	27		15.4	32.2	165	96.9	11.2
	28		15.6	32.2	177	96.2	11.8
	29		16.7	31.6	176	99.1	11.2
	30		14.7	32.4	164	96.9	11.3
	31		16.0	32.1	192	100.0	12.6
	32		17.4	32.2	183	98.4	12.7
	33		16.0	31.9	178	96.0	12.8
	34		16.1	31.5	179	97.0	11.6
	35						
	36		18.0	31.7	199	99.9	13.8
	37		19.4	32.0	181	99.2	13.9
	38		17.9	31.8	177	99.5	12.3
	39		14.5	31.5	170	98.6	11.8
	40		16.9	32.0	193	90.9	12.9
	41		14.7	32.1	169	97.5	11.6
	42		15.7	30.5	183	99.3	11.7
	43		15.5	21.1	130	90.9	11.3
	44		15.4	31.6	175	98.2	12.2

Table C-58. Test 60 monitor gauge (chief of section) pressure-time values for sheep numbers 640 and 641.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		14.3	32.0	184	94.6	11.3
	46		15.6	28.4	179	99.7	12.7
	47		17.2	31.6	176	99.6	12.4
	48		14.5	31.4	179	97.0	12.0
	49		14.5	31.6	182	99.8	12.0
	50		17.0	32.3	179	99.4	13.0
	51		18.2	32.0	178	95.2	12.3
	52		18.1	31.1	189	99.9	13.8
	53		14.6	30.7	174	99.2	11.8
	54		17.4	31.4	191	93.0	13.5
	55		15.0	22.3	125	89.1	11.6
	56		17.4	32.1	179	94.8	12.6
	57		14.2	31.8	174	98.7	10.9
	58		15.6	31.7	181	94.1	12.6
	59		16.6	31.6	179	92.7	11.9
	60		15.4	31.7	186	98.3	12.0
	61		17.6	31.9	180	86.0	12.8
	62		15.2	32.4	174	92.3	11.7
	63		19.1	32.7	179	98.3	12.7
	64		19.0	30.2	182	91.5	13.6
	65		13.5	21.0	125	99.4	11.6
	66		14.4	22.5	122	90.4	11.0
	67		13.8	31.5	173	99.8	11.2
	68		15.2	22.2	125	98.4	11.3
	69		17.0	31.2	177	98.5	12.2
	70		15.1	31.8	177	99.0	11.6
	71		18.5	31.7	184	99.2	13.9
	72		18.3	31.6	182	95.9	13.4
	73		15.9	31.8	182	99.1	12.6
	74		14.9	31.8	175	99.7	11.6
	75		16.1	31.5	174	99.1	11.7
	76		15.7	31.9	190	98.4	12.4
	77		18.0	31.3	180	98.8	13.6
	78		17.4	31.5	190	98.4	14.1
	79		20.1	31.7	180	99.9	12.9
	80		16.8	32.0	179	93.8	12.1
	81		15.4	32.0	180	100.0	11.9
	82		14.5	31.6	174		11.8
	83		16.4	31.7	181	98.1	11.6
	84		16.5	28.3	174	98.8	12.5
	85		16.1	31.3	170	93.8	11.0
	86		15.6	32.1	178	97.6	12.1
	87		16.8	32.0	191	98.7	12.5
	88		15.1	31.9	178	96.2	11.3

Table C-58. Test 60 monitor gauge (chief of section) pressure-time values for sheep numbers 640 and 641.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		16.9	31.8	189	99.8	13.1
	90		15.1	31.5	172	93.8	11.6
	91		13.0	32.2	165		10.2
	92		15.9	31.4	175	99.6	12.1
	93		14.0	32.0	179	99.8	11.4
	94		16.3	22.4	130		12.6
	95		16.5	32.3	175	97.9	12.7
	96		14.5	32.9	167	96.1	10.8
	97		14.6	31.2	176	83.9	11.5
	98		18.5	31.2	186	91.7	14.8
	99		18.5	31.2	186	91.7	14.8
	100		15.5	31.6	172	99.4	12.1
Mean			16.2	30.8	175.4	97.1	12.4
SD			1.6	2.8	16.4	3.5	1.0

Table C-60. Test 62 monitor gauge (chief of section) pressure-time values for sheep numbers 644 and 645.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
3/12/96	1	1814	15.3	31.2	178	97.9	12.2
	2		14.9	22.2	126	94.0	12.0
	3		14.4	32.2	169	99.1	11.6
	4		14.5	31.8	171		12.4
	5		15.6	27.4	154		13.2
	6		16.8	31.2	168	98.8	12.8
	7		14.8	32.2	174	99.9	11.5
	8		15.6	31.8	167	97.4	12.5
	9		15.9	31.3	174	98.9	13.6
	10		14.9			99.7	11.5
	11		14.8	31.8	173	97.9	12.2
	12		14.4			98.6	11.0
	13		15.8	31.8	173	96.8	12.1
	14		15.8	31.5	169	96.4	13.4
	15		15.6	31.9	179		13.0
	16		16.3	31.9	166	95.4	12.2
	17		16.7	31.7	175	99.8	12.8
	18		13.8	32.4	167	97.4	11.2
	19		15.5	31.9	170	97.5	12.2
	20		17.0	31.7	172	99.3	13.5
	21		14.0	31.3	164	91.9	11.2
	22		21.8	30.8	192	99.1	16.7
	23		15.6	32.1	176	98.2	11.8
	24		17.3	31.4	181	93.1	14.2
	25		15.8	31.6	177	96.9	13.2
	26		17.7	31.2	171	100.0	14.2
	27		15.1	31.7	173	99.9	13.0
	28		17.9	31.0	177		14.4
	29		17.6	31.4	180	99.7	14.6
	30		17.7	31.0	165	94.9	13.4
	31		14.5	32.0	157		10.9
	32		15.0	29.5	157	99.6	11.9
	33		17.2	31.3	175	97.1	14.0
	34		14.5	31.3	162	99.8	10.6
	35		16.0	32.0	168	99.3	13.6
	36		14.1	22.1	119	99.9	11.0
	37		15.5	21.4	124	97.6	12.8
	38		15.7	31.3	172	98.0	12.0
	39		15.5	21.3	126		12.6
	40		15.4	31.5	176	96.9	12.0
	41		16.1	31.3	171	99.8	13.0
	42		16.5	30.9	183	100.0	13.5
	43		14.2	31.0	174	94.5	12.0
	44		15.4	31.4	168	99.1	12.6

Table C-60. Test 62 monitor gauge (chief of section) pressure-time values for sheep numbers 644 and 645.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		16.0	30.9	165	93.4	12.2
	46		15.3	31.0	164	99.9	12.4
	47		16.5	31.0	168	99.7	13.3
	48		15.6	31.1	181	99.4	13.3
	49		16.0	31.7	180	96.9	12.9
	50		19.0	27.3	157	91.1	14.0
	51		16.0	31.2	168	98.1	11.7
	52		15.0	31.5	173	99.8	12.1
	53		13.8	31.5	163	95.1	10.9
	54		14.8	31.4	170	99.1	12.2
	55		14.3	31.2	157	97.7	11.3
	56		16.1	30.9	166	93.3	12.4
	57		14.4	31.8	165	99.6	11.8
	58		15.6	30.9	171	98.0	12.1
	59		14.4	21.9	116		10.8
	60		13.0	22.8	117	89.6	10.6
	61		16.0	30.9	158		12.5
	62		16.1	30.9	172	90.3	12.9
	63		15.4	30.8	171	94.7	12.2
	64		14.0	21.2	125	99.9	11.7
	65		14.2	31.0	165	79.1	11.2
	66		16.8	31.3	174	94.1	12.8
	67		15.7	30.6	169	94.1	12.3
	68		15.2	31.2	173	99.9	11.9
	69		16.3	31.6	174	93.8	13.0
	70		14.0	31.4	169	98.1	11.6
	71		15.8	31.5	161	92.3	11.6
	72		16.0	30.6	173	98.2	12.7
	73		17.7	30.7	172	99.9	14.0
	74		17.2	31.4	176	94.9	13.4
	75		15.0	31.4	166	98.9	12.0
	76		15.5	30.7	171	100.0	12.2
	77		14.7	31.0	162	96.8	11.2
	78		14.2	30.8	171	92.0	12.1
	79		14.8	30.8	163	90.9	11.4
	80		16.1	30.9	172	97.5	12.4
	81		16.5	31.4	172	96.2	13.3
	82		15.9	31.0	172	99.5	12.6
	83		16.5	31.4	165	92.6	12.8
	84		14.8	32.2	160	93.0	11.4
	85		15.6	31.2	165	96.2	12.8
	86		16.4	31.2	160	99.0	11.7
	87		13.8	31.2	160	96.8	10.9
	88		14.2	31.0	165	91.8	11.0

Table C-60. Test 62 monitor gauge (chief of section) pressure-time values for sheep numbers 644 and 645.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		15.4	30.7	171	96.6	12.7
	90		16.9	31.1	167	92.4	12.4
	91		15.4	31.0	168	96.8	11.9
	92		14.4	31.0	167	99.9	12.0
	93		15.8	28.3	170	96.0	13.2
	94		14.3	31.8	161	99.6	11.0
	95		16.4	30.9	170	99.1	12.6
	96		15.2	31.0	166	97.0	12.3
	97		15.7	30.9	167	99.8	12.9
	98		16.0	30.7	170	96.5	12.9
	99		15.4	21.4	121	99.1	11.7
	100		16.6	27.0	150	93.0	13.5
Mean			15.6	30.4	165.3	96.8	12.4
SD			1.2	2.7	14.6	3.4	1.0

Table C-61. Test 63 monitor gauge (chief of section) pressure-time values for sheep numbers 646 and 647.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
3/19/96	1	1814	17.0	31.1	180	99.0	13.6
	2		14.1	32.0	170	97.5	11.8
	3		15.1	32.5	169	100.0	12.6
	4		14.2	26.4	140	99.4	11.8
	5		18.0	31.0	179	98.6	14.0
	6		14.7	32.4	167	99.6	11.9
	7		17.4	31.2	177	96.1	13.0
	8		19.0	31.3	174	94.6	13.8
	9		14.4	22.5	123	85.8	12.1
	10		15.1	32.0	171	98.8	11.9
	11		15.0	32.4	168	98.4	12.0
	12		18.4	21.7	127	96.5	13.0
	13		15.3	31.9	170	98.9	12.2
	14		13.8	27.1	141	98.6	10.9
	15		14.7	31.8	176	98.6	12.6
	16		17.8	21.8	127	98.0	12.0
	17		16.1	31.2	183	98.3	13.0
	18		15.2	31.6	185	98.3	12.2
	19		16.6	32.2	167	96.5	12.3
	20		18.1	31.4	180	98.2	13.9
	21		16.6	32.8	170	99.0	13.2
	22		16.2	22.0	125	96.6	12.0
	23		14.2	31.5	175		12.3
	24		15.1	31.3	163	97.6	12.1
	25		15.4	31.6	159	98.8	12.2
	26		16.8	31.1	178	100.0	13.0
	27		15.6	31.4	175	99.8	12.2
	28		17.8	27.4	155	96.2	13.1
	29		16.8	32.0	175	99.0	13.1
	30		15.1	31.1	178	99.8	12.1
	31		16.9	31.5	172	96.5	13.7
	32		14.3	21.5	115	94.0	11.1
	33		15.4	31.3	172	98.7	12.0
	34		15.9	21.7	122	98.9	11.5
	35		18.0	31.1	177	96.1	13.5
	36		15.9	32.0	169	97.6	12.9
	37		15.5	31.5	165	98.4	12.0
	38		16.1	32.3	158	95.9	11.6
	39		17.8	21.7	125	98.5	12.7
	40		14.5	31.3	177	99.9	11.5
	41		16.6	30.1	161	94.2	11.4
	42		14.8	31.1	177	97.6	11.6
	43		16.2	31.1	164	99.5	12.0
	44		15.3	29.8	164	98.2	11.9

Table C-61. Test 63 monitor gauge (chief of section) pressure-time values for sheep numbers 646 and 647.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	45		15.1	31.6	174	99.8	12.0
	46		16.5	31.8	164	96.2	15.0
	47		15.0	32.0	171	98.0	11.5
	48		16.7	31.6	177	95.8	13.3
	49		16.1	21.6	126	99.9	13.0
	50		14.7	31.2	166	96.0	11.6
	51		15.9	31.9	166	95.8	11.5
	52		16.1	32.3	160	98.7	11.2
	53		16.4	31.1	181	98.9	12.5
	54		17.4	30.5	177	98.2	12.6
	55		17.4	31.3	175	98.3	12.5
	56		18.3	31.2	174	97.1	14.3
	57		15.4	31.7	167	92.3	11.6
	58		16.0	31.6	178	99.8	12.0
	59		17.4	31.4	185	98.2	13.7
	60		14.9	22.2	125	98.5	12.7
	61		15.3	27.2	141	93.9	12.0
	62		15.2	31.4	173	97.8	12.1
	63		16.9	27.2	158	99.0	14.1
	64		14.9	31.2	168	94.1	12.0
	65		15.8	30.9	169	97.9	12.2
	66		16.9	31.6	167	96.0	12.7
	67		15.4	31.2	171	96.1	12.3
	68		16.7	31.0	173	95.0	12.1
	69		16.5	31.3	168	95.6	12.2
	70		15.2	30.9	174	97.5	12.8
	71		14.6	31.2	176	95.3	11.8
	72		17.7	31.2	174	100.0	12.9
	73		17.6	31.5	181	99.5	13.7
	74		16.3	31.0	170	99.2	12.6
	75		14.9	31.3	170	97.0	11.6
	76		18.9	31.3	171	95.4	14.7
	77		15.2	31.8	171	97.8	12.4
	78		14.0	31.1	164	98.1	11.0
	79		15.3	31.4	166	97.7	11.0
	80		17.7	31.5	175	98.5	14.2
	81		16.7				13.3
	82		15.0	31.7	168	99.2	12.1
	83		15.3	31.2	169	98.2	11.5
	84		17.9	27.2	161	96.0	13.6
	85		18.4	31.0	182	99.9	14.5
	86		18.5	30.9	171	97.7	13.4
	87		16.0	31.8	165	95.5	12.3
	88		14.9	32.2	170	98.4	11.6

Table C-61. Test 63 monitor gauge (chief of section) pressure-time values for sheep numbers 646 and 647.

155mm SPH Simulator Pressure-Time Records							
Date	Shot Number	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
	89		17.4	21.3	174	94.6	13.1
	90		17.4				13.1
	91		19.9	31.8	176	97.3	14.6
	92		17.8	31.9	170	97.2	14.0
	93		16.0	31.6	173	99.3	12.5
	94		15.8	29.6	164	98.0	11.9
	95		15.7	31.2	170	95.8	12.6
	96		15.1	31.0	173	99.8	12.5
	97		19.1	31.1	178	95.8	14.7
	98		18.0	31.3	174	98.3	12.9
	99		15.1	31.6	170	95.7	11.7
	100		17.7	31.1	176	94.8	12.8
Mean			16.2	30.2	166.1	97.5	12.6
SD			1.4	3.1	15.7	2.1	0.9

Table C-62. Average monitor gauge (chief of section) pressure-time values for all sheep tests.

155mm SPH Simulator Monitor Gauge Average Pressure-Time Records								
Date	Test Number	Number of Shots	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
4/20/95	3	6	3310	22.1	31.1	279	114.4	16.9
4/25/95	4	6	3310	24.1	30.9	279	99.4	17.8
4/27/95	5	6	3310	23.8	30.9	295	92.9	18.7
5/2/95	6	6	3310	23.4	31.4	277	98.8	16.9
5/4/95	7	6	3310	24.2	30.9	284	97.7	18.4
5/11/95	8	6	2722	21.0	31.4	243	95.9	15.6
5/16/95	9	6	2722	21.1	31.2	246	99.3	16.3
5/18/96	10	6	2722	20.7	30.9	237	98.8	15.5
5/23/95	11	6	2722	21.7	30.5	238	97.8	16.2
5/30/95	12	6	2722	20.4	31.5	237	99.3	15.8
6/1/95	13	6	2268	17.4	30.1	202	89.9	13.6
6/6/95	14	6	2268	17.7	31.4	207	93.2	13.7
6/8/95	15	6	2268	17.9	31.3	208	90.1	13.9
6/13/95	16	6	2268	18.0	30.8	207	95.5	13.8
6/15/95	17	6	2268	17.4	32.0	184	98.6	13.6
6/22/95	18	25	2268	18.2	30.8	208	95.3	14.1
6/27/95	19	25	2268	18.4	30.8	207	96.0	14.0
6/29/95	20	25	2268	18.8	30.7	206	96.5	14.2
7/6/95	21	25	2268	18.1	30.7	207	96.0	14.1
7/18/95	22	25	2268	18.1	30.5	206	96.7	13.0
7/25/95	23	25	1814	14.9	30.4	167	96.1	11.6
7/27/95	24	25	1814	14.7	31.0	171	97.1	11.8
8/1/95	25	25	1814	15.1	30.6	167	97.5	11.9
8/3/95	26	25	1814	14.9	31.0	170	95.8	11.8
8/8/95	27	25	1814	15.3	30.3	168	96.2	11.9
8/15/95	28	6	2268	17.5	30.1	208	98.4	14.0
8/17/95	29	100	1814	15.1	30.4	166	96.7	11.5
8/22/95	30	6	2268	17.5	30.4	205	98.7	13.9
8/24/95	31	100	1814	15.0	30.4	169	99.3	11.8
8/29/95	32	6	2268	15.3	30.6	177	100.0	11.9
9/5/95	33	6	2268	17.3	30.5	208	98.2	13.9
9/7/95	34	100	1814	14.8	30.4	169	97.6	11.8
9/12/95	35	6	2268	17.5	30.4	208	97.1	14.0

Table C-62. Average monitor gauge (chief of section) pressure-time values for all sheep tests.

155mm SPH Simulator Monitor Gauge Average Pressure-Time Records								
Date	Test Number	Number of Shots	Charge Weight,g	Pmax, kPa	Ta, ms	A-impulse kPa*ms	Td, ms	Psm, kPa
9/14/95	36	100	1814	14.9	30.4	170	97.4	11.7
9/21/95	37	100	1814	15.2	30.5	175	98.7	12.2
10/5/95	38	25	2722	21.4	30.8	242	98.0	16.5
10/10/95	39	25	2722	21.3	31.0	243	98.2	16.3
10/17/95	40	25	2722	21.0	30.2	236	98.2	16.3
10/19/95	41	25	2722	20.9	30.8	242	98.2	16.2
10/24/95	42	25	2722	21.5	30.9	244	98.8	16.4
11/9/95	43	6	2268	17.1	31.2	207	98.4	13.6
11/14/95	44	100	1814	15.7	29.9	168	97.9	12.2
11/16/95	45	6	2268	18.4	31.7	213	99.7	14.1
11/21/95	46	100	1814	15.8	29.6	168	97.3	12.2
11/29/95	47	100	1814	16.1	29.2	167	97.3	12.4
11/30/95	48	6	2268	18.5	29.6	200	96.9	14.2
12/5/95	49	100	1814	15.7	29.4	167	97.3	12.1
12/7/95	50	6	2268	19.6	31.4	220	99.0	14.8
12/12/95	51	100	1814	16.1	29.3	167	97.6	12.3
12/14/95	52	6	2268	18.4	31.2	217	99.2	14.1
12/19/95	53	100	1814	16.0	29.8	169	97.3	12.2
1/9/96	54	100	1814	16.4	28.6	166	99.3	12.4
1/16/96	55	100	1814	16.2	29.9	171	98.4	12.5
2/1/96	56	100	1814	15.5	30.7	174	97.8	12.1
2/9/96	57	100	1814	15.8	30.0	171	98.0	12.2
2/13/96	58	100	1814	15.9	30.5	173	98.3	12.3
2/20/96	59	100	1814	15.9	31.0	176	97.7	12.5
2/29/96	60	100	1814	16.2	30.8	175	97.1	12.4
3/12/96	62	100	1814	15.6	30.4	165	96.8	12.4
3/19/96	63	100	1814	16.2	30.2	166	97.5	12.6

EG&G MSI

ALBUQUERQUE OPERATIONS

2450 Alamo Avenue, S.E., P.O. Box 9100, Albuquerque, New Mexico 87119
phone (505)243-2233, TWX No. 910-989-1684, FAX No. (505)243-1021